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Vocal and Respiratory Conditioning (VRC) Program: intervention proposal for voice professional

Programa Condicionamento Vocal e Respiratório (CVR): proposta de intervenção para profissionais da voz

Programa de Condicionamiento Vocal y Respiratorio (CVR): propuesta de intervención para profesionales de la voz

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Abstract

Intervention program for voice professionals may cover strategies for vocal and respiratory muscle training. The integration of speech-language pathology and physiotherapeutic interventions in these approaches has resulted in positive outcomes. This communication aims to introduce a proposal for speech-language pathology and physiotherapy intervention called Vocal and Respiratory Conditioning (VRC). Developed with voice professionals and consisting of eight weekly meetings, this proposal aimed to increase the vocal and respiratory endurance of the participants, promoting better professional performance. On the one hand, semi-occluded vocal tract exercises using commercial and silicone straws

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LPF, MCMB, RE: Study conception and outline; methodology; data collection; critical review and guidance.
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were indicated for phonation; on the other hand, exercises with a flow stimulator (Respiron®) were performed for breathing.

Keywords: Voice; Speech Therapy; Voice training; Respiratory Muscle Training; Endurance; Respiratory Function Test.

Resumo

Programas de intervenção para profissionais da voz podem englobar estratégias de treinamento muscular vocal e respiratório. Neste tipo de abordagem, a integração de ações fonoaudiológicas e fisioterapêuticas tem produzido resultados positivos. A presente comunicação tem como objetivo apresentar uma proposta de intervenção fonoaudiológica e fisioterapêutica denominada Condicionamento Vocal e Respiratório (CVR), desenvolvida com profissionais da voz. Composta por oito encontros semanais, ela teve como objetivo aumentar a resistência vocal e respiratória dos participantes, promovendo melhor desempenho profissional. Para a fonação, foram indicados exercícios de trato vocal semiocluído com a utilização de canudos comerciais e de silicone; para a respiração, foram realizados exercícios com um incentivador a fluxo (Respiron Classic®).

Palavras-chave: Voz; Fonoterapia; Treinamento da voz; Exercícios Respiratórios; Endurance; Testes de Função Respiratória.

Resumen

Los programas de intervención para profesionales de la voz pueden incluir estrategias de entrenamiento de los músculos vocales y respiratorios. En este tipo de abordaje, la integración de las acciones de fonoaudiología y fisioterapia ha producido resultados positivos. Esta comunicación tiene como objetivo presentar una propuesta de intervención fonoaudiológica y fisioterapeutica denominada Condicionamiento Vocal y Respiratorio (CVR), desarrollada con profesionales de la voz. Compuesto por ocho reuniones semanales, tuvo como objetivo aumentar la resistencia vocal y respiratoria de los participantes, promoviendo un mejor desempeño profesional. Para la fonación, se indicaron ejercicios de vías vocales semicerrados utilizando canutos comerciales y de silicona; para la respiración, los ejercicios se realizaron con un estimulador de flujo (Respiron Classic®).

Palabras clave: Voz; Logoterapia; Entrenamiento de la Voz; Ejercicios Respiratorios; Resistencia Física; Pruebas de Función Respiratoria

Introduction

Many studies and research in the 90's of the last century focused on the daily life of the so-called voice professionals (singers, actors, teachers, telemarketers, among others) in order to understand the impact of biological (allergies, gastroesophageal reflux, hormonal disorders, lifestyle, etc.), environmental (noise, dust, temperature change, etc.) and work organization (stress, overwork, goals to be met, among others) factors in voice production[1].

With respect to the aspects developed by speech-language pathologists with these professionals, phonation and breathing were frequently highlighted among the practices related to voice rehabilitation or improvement.

As for phonation, there is an emphasis on the use of vocal exercises, especially the so-called Semi-occluded vocal tract exercises (SOVTE). Exercises of sound vibration of the tongue and, more recently, the exercises performed with commercial straws or tubes (e.g., Lax Vox®) have shown to be effective in intervention proposals with different objectives[2,3].

The work developed by physiotherapists and speech-language pathologists with the respiratory muscles allows changes in ventilation, pressure and air flow that are necessary for speech and singing[2].

Controlled expiration to and beyond the point of functional residual capacity, as required for speech and singing, involves an active process by which inspiration and expiratory muscles contract

synergistically to regulate air flow and pressure based on air volume in the lungs[4].

More recently, the integration of speech-language pathology and physiotherapeutic work has been shown to be positive, especially in the work with high-performance singers, since it allowed the performance of vocal and respiratory conditioning exercises, improving the subjects' vocal performance. The group that carried out this work reports that it is necessary to keep in mind the physiology of physical exercise, as well as to know cardiorespiratory endurance, strength, flexibility, muscular endurance, power, speed, coordination, agility, balance and precision[5].

When looking for references on the issue of vocal conditioning in the bibliographic sources, a study including a literature review reports that studies have shown that phonation with the aid of tubes in singers produces positive effects on vocal quality, with greater phonatory comfort and vocal projection, more economical emission, increased collision threshold during phonation in a tube immersed in water and more consistent intraoral pressures after phonation in a narrow straw, thus favoring efficient and effective vocal therapy[6].

Other experiences are in line with this study. There is also a research conducted with voice professionals proposing an individual vocal conditioning program for three voice professionals and which identified positive effects, with emphasis on reports of improvement in vocal comfort and performance when singing, after performing the selected exercises[7].

In turn, another study that included 23 singers who were students of lyric singing, and who underwent an intervention performed with semi-occluded vocal tract exercises (SOVTE) using a Lax Vox® tube for three minutes, reported that most participants had better post-exercise production, both in speech and singing, although experts who assessed pre- and post-exercise productions (sustained production, speech and singing) did not register any difference. This study also included a vowel acoustic analysis that indicated an increase in fundamental frequency (f0) and a reduction in the post-exercise Glottal to Noise Excitation (GNE) Ratio[8].

Thus, this communication aimed to describe the Vocal and Respiratory Conditioning (VRC) Program, which is an intervention proposal that includes vocal and respiratory muscle training, focusing on the description and analysis of its elaboration process.

This proposal had positive results when put into practice at the end of the process presented at scientific events[9,10]. However, this study was focused on the presentation of the procedure.

Description

In the second half of 2018, some voice professionals contacted the Orofacial Motricity and Voice Service of the Clinic of the Division for Education and Rehabilitation for Communication Disorders (Derdic) of the Pontifícia Universidade Católica de São Paulo (PUC-SP) aiming to improve the voice in order to achieve better vocal performance conditions in a professional context.

The planning of a pilot project was initiated through a partnership of students from the Speech-Language Pathology and Audiology Course at PUC-SP and the Improvement in Orofacial Motricity and Voice from Derdic, being carried out in groups and with weekly meetings.

According to a specific day and time, the proposal was presented to three participants (a sports announcer (P1), an impersonator (included in the context of the sports voice) (P2) and a singer (P3)), and 10 weekly 1-hour meetings were scheduled.

The exercises were organized so that breathing and phonation functions could be worked out gradually. Elastic bands of medium and strong compression were used in the work with breathing, in order to offer resistance during inspiration and expiration, and to stimulate the flexibility of the muscles involved in the activities. In turn, phonation included semi-occluded vocal tract exercises (300 ml thermal styrofoam cup with a 2mm hole at the bottom, Lax Vox® silicone flexible tube and low and high resistance plastic straws).

The exercises presented at each meeting were supposed to be performed at home, every day, three times a day. Participants were instructed to classify voice quality and phonatory comfort from 0 to 10 (being 0=less comfortable and 10=more comfortable), in the pre and post-exercise moments, on a daily control sheet specially designed for this activity. This strategy favored the daily monitoring of the execution of the task, in addition to enabling the monitoring of the evolution of the participants.

At the end of the time defined for the exercise, one of the participants (P1) who performed the

exercises more assiduously, performing all the tasks proposed and constantly providing a feedback since the first day, reported that he perceived a better vocal conditioning each week, with more prolonged production of the word "goal", without vocal tiredness at the end of the matches. Despite the effort, another participant (P2) had some issues related to posture and voice that were worked on individually, at another time. Gradually, this participant was able to participate in the group with a better performance. Finally, although interested, the third participant (P3) performed the exercises during the meetings, but hardly performed them during the week. This fact is likely to have limited his improvement, which was not recorded in the same way, when compared to that of the other two participants. Even so, his complaints related to vocal fatigue in professional activity have decreased significantly. In addition to the records, reports of improved vocal performance and decreased complaints of voice fatigue throughout the process, as well as better voice quality and phonatory comfort (identified by the scores given every week by the participants), showed the progress of the participants and consequent positive effect of the program.

In the discussion of the results, the study decided to deepen the issues related to respiratory conditioning and a research project that included the participation of supervisors and scholarship holders (Scientific Initiation) of the Speech-Language Pathology and Physiotherapy courses at PUC-SP. Thus, the group was monitored by monthly meetings and a new program, also called the Vocal and Respiratory Conditioning (VRC) Program, was carried out once again at the Derdic Clinic in the following semester.

The program was conducted by the head of the Orofacial Motricity and Voice Service of the institution, supported by the Scientific Initiation (CI) fellows (one from the Physiotherapy Course, who directed breathing exercises, and the other from the Speech-Language Pathology and Audiology Course, who was responsible for recording the meetings), since the project was approved in the Institutional Program of Scientific Initiation Scholarships of PUC-SP (PIBIC-PUC-SP). It should be noted that the students involved were guided by teachers from their respective courses.

Initially, the planning provided that the VRC program would start as soon as participants were selected. However, during the interview at the first contact with them, it was noticed that some issues related to voice production were not known to everyone in the same way, since each had different experiences regarding vocal work. Thus, five essentially practical meetings were organized, aiming to present exercises and information on vocal production in order to calibrate the group. The study selected strategies aimed at promoting self-perception of the body-voice relationship, using specifically and gradually the following subsystems:

- breathing (wide, complete and use of breaks)
- phonation (maximum efficiency, minimum effort)
- articulation (open, precise, well-defined)
- resonance (balanced, resonant voice in the face)
- prosody (rich modulation, according to the message)

The meetings of this group were held on Mondays, from 2 pm to 3 pm, between August 5 and September 9, 2019. The group started after the inclusion of six participants who were informed that, after the meetings that would work on the self-perception of the body-voice relationship, they would participate in the Conditioning Program. Only three remained in the group after some participants left due to unavailability of time: S1, who was a designer and actor; S2, who was an astrologer and teacher, and also did voice over on a community radio; and S3, who was a designer and singer.

Some principles were established for the planning of the Vocal and Respiratory Conditioning (VRC) Program: frequency, which would be the number of times that a given exercise would be performed per day or week; duration, that is, to set the duration of an exercise or the number of repetitions of a given series; intensity, which corresponds to the type of exercise in relation to the effort; and, finally, the progression of the exercises[11].

Thus, a spreadsheet was prepared to organize what would be presented each week. Although a sequence has been defined, the study naturally respected individuality[5] and the presentation of the exercises according to the possibility of each participant.

The proposal considered the issue of overload, with a progressive increase to promote vocal and respiratory endurance. The Program focused on muscle strength and endurance with evolution in the graduation of the equipment and series, which means that the progression occurred by increasing

the resistance offered to the air flow; with progression by increasing the frequency and number of repetitions, and individuality, with respect to the time and comfort of each participant.

Respiratory muscle training was performed in four series as follows: two of ten repetitions focusing on the external intercostal muscle and two, also of ten repetitions, focusing on the diaphragm muscle in the first sessions. The evolution occurred in the middle of the training (5th meeting), in which two sets of 12 repetitions were performed focusing on the external intercostal muscle and two, with 12 repetitions, focusing on the diaphragm muscle. Finally, the last two weeks included two series with 15 repetitions focusing on the external intercostal muscle and two series with 15 repetitions focusing on the diaphragm muscle using the Respiron Classic® device.

The vocal exercises used plastic straws and the Lax Vox® silicone tube. At the first meeting, participants were asked to produce a high-pitched monotone sound with a milkshake straw, and then a modulated sound ranging from low to high in 12 seconds; the Lax Vox® silicone straw was introduced in the following two meetings, with the same request for sound production, in 12 seconds in the first week, and in 14 seconds in the second week. In the other two meetings, participants used the lollipop straw (90mm long X 3.5mm in diameter X 0.3mm thick), repeating the same sound production request, in 14 seconds in the first week and in 16 seconds in the second week. In the last three weeks, the vocal work included a lollipop straw (25 cm long) and repeated again the sound production presented in the first meeting, in 12 seconds. In the meetings, 10 repetitions were requested for each production. At all times, the exercises should be performed first in a hyperacute monotone and then modulated (making the sound higher and lower).

Similarly with the group described above, participants were instructed to perform the exercises presented each week at home. However, due to the work associated with Respiron Classic®, participants were recommended to perform the exercises twice. This task should be performed according to the number of sets and repetitions worked during the meetings, with vocal exercises taking approximately two to three minutes.

A registration sheet was provided to the participants, which should be filled out and returned at the subsequent meeting, to keep track of the intensity of the training performed by the subjects. Before starting training, participants should use the sheet to record a note (from 0 to 10) twice a day, considering respiratory and vocal comfort after counting numbers from 1 to 10. The same procedure was requested at the end of each training session, resulting in a total of 28 records to be delivered by each participant each week. Then, before starting work for the following week, participants were asked about their week, the challenges they encountered, their difficulties and doubts.

Chart 1 shows the work conducted each week.

Chart 1. Exercises performed at each meeting in the VRC program and redone at home daily twice.

Weekly meeting	Breathing Work			Vocal Work (total of 2-3 minutes)			
	Instrument	Series	Repetitions	Instrument	Seconds	Sound	Repetitions
1st	Respiron Classic®	2 Intercostal muscles	10	Milkshake straw	12	Hyperacute	10
		2 Diaphragmatic muscles	10			Modulated	10
2nd	Respiron Classic®	2 Intercostal muscles	10	Lax Vox®	12	Hyperacute	10
		2 Diaphragmatic muscles	10			Modulated	10
3rd	Respiron Classic®	2 Intercostal muscles	10	Lax Vox®	14	Hyperacute	10
		2 Diaphragmatic muscles	10			Modulated	10
4th	Respiron Classic®	2 Intercostal muscles	10	Lollipop straw	14	Hyperacute	10
		2 Diaphragmatic muscles	10			Modulated	10
5th	Respiron Classic®	2 Intercostal muscles	12	Lollipop straw	16	Hyperacute	10
		2 Diaphragmatic muscles	12			Modulated	10
6th	Respiron Classic®	2 Intercostal muscles	12	Lollipop straw	12	Hyperacute	10
		2 Diaphragmatic muscles	12			Modulated	10
7th	Respiron Classic®	2 Intercostal muscles	15	Lollipop straw	12	Hyperacute	10
		2 Diaphragmatic muscles	15			Modulated	10
8th	Respiron Classic®	2 Intercostal muscles	15	Lollipop straw	12	Hyperacute	10
		2 Diaphragmatic muscles	15			Modulated	10

Legend: Intercostal muscles=stimulation of intercostal muscles; diaphragmatic muscles=stimulation of diaphragmatic muscles.

Given that a research was being developed at the moment, instruments with questions involving handicap and vocal fatigue were applied[12-14].

With respect to the participants' self-perception, it was possible to notice through the system of recording notes performed each week, regarding vocal and respiratory comfort, that the improvement process was upward in the comparison of the moments before and after the exercises, as well as, every week it was performed.

Records of comfort level during the activity, whether through classification or the use of a visual analog scale, have been used in different fields of health[15], as it is a fast and effective way of recording, in addition to considering the perception of the subject exposed to a given intervention.

Reports led by questions ("Was it good? If yes/no, why?" "Would it be better if", etc.) were made at the end to better understand the experience of the participants in this process and showed improvement in four aspects: self-perception (that is, the participants had greater knowledge of the respiratory and phonatory systems, with special attention to the responses of the organism itself); motivation (since the improvement in the performance of the exercises served as a stimulus to continue the program); with minor reports of improvements in the feeling of fatigue; and greater control of breathing. All participants reported an interest in continuing the program, which reinforces the need for monitoring, even with a longer time between each meeting. This ensures that participants actually incorporate the strategies presented in their daily lives, or even other strategies that can also support the best vocal and respiratory performance in the personal and professional context.

In general, participants reported their notes and exchanged challenges and achievements each week. It should be noted that the option for group work, which is an effective and proven practice in

other studies, whether in health promotion, prevention or rehabilitation of disorders[16,17], provided constant motivation among the participants. The group became a space for exchanging experiences, identifying with the story told by others and stimulating when one of them was less engaged in performing the exercises[18].

Part of this is also due to the meetings having been initiated by questions that led the participants to report their week, followed by guidance on the difficulties presented by the professionals who conducted the program or the participants themselves.

Finally, considerations will be made on aspects related to specificity, individuality and reversibility[5].

As for specificity, the program developed aimed at better respiratory and vocal conditioning. The study showed that the improvement of one aspect, in this case breathing, did not immediately affect the other (voice) due to the musculature involved in the two functions being recruited in a specific way for each one of them. As for individuality, participants were monitored during the program and, although the schedule for each week was pre-established, adjustments were made in the face of reports of any difficulties. For example: proposal to adjust the Respiron Classic® ring specific to each participant, or to return to a type of straw previously presented for a longer time before advancing to another level. The reversibility was perceived mainly when the S2 had difficulty to perform the exercises in the middle of the program, as he was undergoing adaptation of the dental prosthesis. This could be seen in the absence of an evolution in the classification record, as opposed to what was reported by colleagues. According to Vaiano and Badaró[5], the lack of training in two weeks will require a few weeks to recover the resistance, strength and flexibility of the muscles.

The number of meetings defined for the VRC program should also be highlighted. This study included ten meetings, using the first and the last for data collection, and the other eight for the execution of the proposal. The speech-language pathology literature does not provide affirmative data on the number of meetings or sessions, when interventions are proposed. Some examples can be reported: the four-meetings proposal, as presented by Masson and Araújo[19], when analyzing interventions performed with sound amplification and nebulization practice; the six-meetings proposal, as presented by Pereira et al.[20], when describing the findings of vocal warm-up intervention and respiratory training, based on another study[21] to set the time; and, finally, Lima et al. [3], who presented an 18-day systematic speech-language pathology therapy proposal in an adult male patient with vocal fold paralysis, using tube phonation techniques. Studies that analyze the effects of the practice with SOVTE usually perform an immediate evaluation, after the exercises[22].

With regard to muscle conditioning, Vaiano and Badaró[5] reported that four to eight weeks of exercise are required to provide a response regarding the improvement of strength levels, followed by muscle hypertrophy.

Final Considerations

Given the scarcity of bibliographic sources reporting sequences of speech-language pathology strategies, planned for a given objective - especially for better vocal and respiratory conditioning - it can be concluded that this Program has the potential to show positive effects. Other professionals are invited to discuss the procedures presented herein and even put this proposal into practice, in order to further integrate the work of speech-language pathologists and audiologists, and physiotherapists, in issues related to voice and breathing.

References

1. Brasil Ministério da Saúde (BR), Secretaria de Vigilância em Saúde. Departamento de Vigilância em Saúde Ambiental e Saúde do Trabalhador. Brasília (DF); 2018. 42 p: il. (Saúde do Trabalhador; 11. Protocolos de Complexidade Diferenciada).

2. Andrade SR, Cielo CA, Schwarz K, Ribeiro VV. Terapia vocal e sons nasais: efeitos sobre disfonias hiperfuncionais. Rev. CEFAC. 2016;18 (1): 263-272.

3. Lima JPM, Cielo CA, Christmann MK. Fonoterapia com fonação em tubos em paciente com paralisia de prega vocal medializada cirurgicamente: estudo de caso. Speech therapy with phonation into tubes in a patient with vocal fold paralysis surgically medialized: a case study. Rev. CEFAC. 2016. 18 (6): 1466-1474

4. Hixon T, Weismer G, Hoit J. Preclinical Speech Science: Anatomy and Physiology. San Diego: CA, Plural Publishing; 2008.

5. Vaiano T, Badaró F. Fisiologia do exercício na clínica vocal. In: Lopes L, Moreti F, Ribeiro LL, Pereira EC (organizadores). Fundamentos e Atualidades em Voz Clínica. Rio de Janeiro: Thieme Revinter; 2019.

6. Mendes ALF, Dornelas do Carmo R, Dias de Araújo AMG, Paranhos LR, da Mota CSO, Schneiberg S, Reis FP, Aragão JA. The Effects of Phonation into Glass, Plastic, and LaxVox Tubes in Singers: A Systematic Review. J Voice. 2018; 33 (3): e381. https://doi.org/10.1016/j.jvoice.2017.12.005

7. Behlau M, Morteli F, Pecoraro G. Customized vocal conditioning for singing professional voice users – case report. Rev CEFAC. 2014; 16 (5): 1713-1722

8. Fadel CBX, Dassie-Leite AP, Santos RS, Santos CG Jr, Dias CAS, Sartori DJ. Efeitos imediatos do exercício de trato vocal semiocluído com Tubo LaxVox em cantores. CoDAS. 2016; 28 (5): 618-624.

9. Borrego MC, Zuleta PPB, Ferreira LP. Condicionamento vocal: experiência exitosa com profissionais da voz. Anais do X Congresso Internacional. XXVII Congresso Brasileiro de Fonoaudiologia. III Encontro Mineiro de Fonoaudiologia. 9 a 12 de outubro de 2019. Belo Horizonte-MG. 2019. http://sbfa.org.br/portal/anais2019/eposter/eposter_11605.pdf

10. Borrego MCM, Escorcio R, Ferreira LP, Santos TP, AA Silva, MZ Silva, PPB Zuleta. Condicionamento vocal e respiratório: efeitos de intervenção fonoaudiológica e fisioterapêutica em profissionais da voz. Fono 2020, XXVIII Congresso Brasileiro de Fonoaudiologia, V Congresso Ibero Americano de Fonoaudiologia; 2020 out 7-10; On-line; São Paulo: SBFa, 2020.

11. Paes SM, Behlau M. Efeito do tempo de realização do exercício de canudo de alta resistência em mulheres disfônicas e não disfônicas. CoDAS. 2017; 29 (1): e20160048 https://doi.org/10.1590/2317-1782/20172016048.

12. Abou-Rafée M, Zambon F, Badaró F, Behlau M. Fadiga vocal em professores disfônicos que procuram atendimento fonoaudiológico. CoDAS. 2019; 31 (3): e20180120. https://doi.org/10.1590/2317-1782/20182018120

13. Costa T, Oliveira G, Behlau M. Validação do Índice de Desvantagem Vocal: 10 (IDV-10) para o português brasileiro. CoDAS. 2013; 25 (5): 482-485.

14. Rocha BR, Moreti F, Amin E, Madazio G, Behlau M. [Cross Cultural adaptation of the brazilian version of the protocol evaluation of the ability to sing easily]. CoDAS. 2014; 26 (6): 535-9. https://doi.org/10.1590/2317-1782/20142014175

15. Marques Jr NK. Confiabilidade da escala de faces da percepção subjetiva da dor muscular do esforço físico do voleibol: um estudo no voleibol mater. RBPFEX. 2017; 11 (67): 405-415.

16. Vilela FCA, Ferreira LP. Voz na clínica fonoaudiológica: grupo terapêutico como possibilidade. Distúrb Comun. 2006; 18 (2): 235-243.

17. Becker APS, Rocha NL. Ações de promoção de saúde em sala de espera: contribuições da Psicologia. 2017; 11(21): 339-355.

18. Albanaes P, Rodrigues KJR, Pellegrini PG, Tolfo SR. Intervenção em grupo de apoio psicológico a trabalhadores vítimas de assédio moral. Rev de Psicología. 2017; 35 (1): 61-96. http://dx.doi.org/10.18800/psico.201701.003

19. Masson, MLV, Araujo TM. Protective Strategies Against Dysphonia in Teachers: Preliminary Results Comparing Voice Amplification and 0.9% NaCl Nebulization. J Voice. 2018; 32 (2) e1-257.e10.

20. Pereira LPP, Masson MLV, Carvalho FM. Aquecimento vocal e treino respiratório em professores: ensaio clínico randomizado. Rev Saúde Pública. 2015; 49:67 DOI:10.1590/S0034-8910.2015049005716

21. Roy N, Weinrich B, Gray SD, Stemple JC, Sapienza CM. Three treatments for teachers with voice disorders: a randomized clinical trial. J Speech Lang Hear Res. 2003;46(3):670-88. DOI:10.1044/1092-4388(2003/053).

22. Costa CB, Costa LHC, Oliveira G, Behlau M. Efeitos imediatos do exercício de fonação em canudo. Rev Bras Otorrinolaringol. 2011; 77(4): 461-465.