

DOI: <https://doi.org/10.56663/rop.v1i1.45>

Effectiveness of using the resonant vocal techniques in singing voice disorders

Viorel Agheană

University of Bucharest, Faculty of Psychology and Educational Sciences, Senior Lecturer, PhD.

Ligia Mircea

University of Bucharest, Faculty of Psychology and Educational Sciences, M.S.Ed.

Abstract

Singing voice disorders are an important segment of vocal pathology, targeting a niche of professional and amateur singers of all musical genres. The aim of this study is to evaluate the effectiveness of using the principles of vocal hygiene and the eclectic vocal therapy model by combining three resonant vocal techniques: humming, the method of disguised yawning and the chewing technique, in the corrective-recuperative vocal therapy program. The positive effects of the vocal therapy used in all five case studies were observed. If the initial assessment relates to altered vocal parameters, pain in the laryngeal muscles and a negative influence of vocal problems on quality of life, the final assessment found normalization of vocal parameters, decreased pain and improved the quality of life.

Keywords: voice disorders, vocal pathology, vocal therapy, resonant vocal techniques.

Introduction

As a component of language, speech ensures its materialization in communicative acts through vocal production (phonation), pronunciation of speech sounds (articulation of language sounds), and appropriate speech rhythm. Therefore, the voice being "a function integrated into the characteristics of the whole organism, conditioned by psychic sensitivity and somatic suppleness" (Gîrbea&Cotul 1967), it can manifest itself differently, depending on the context, the state of health, and the experiences of the individual.

The mechanisms that characterize verbal language are phonation (the primary sound production mechanism at the level of the larynx), resonance (the mechanism of sound amplification at the level of the resonance cavities), and articulation (the mechanism of sound processing and remodeling in the oral cavity). Voice production results from a complex process of fluid-structure-acoustic interaction, in which interaction depends on the geometry and material properties of the lungs, larynx, and vocal tract, the ultimate interest of the voice is its acoustics and perception (Zhaoyan Zhang, 2016).

Voice disorders represent only a segment of the total number of language and communication disorders and are defined by a disturbance of vocal sound parameters, vocal fatigue, arising from an increased effort required during vocal production, and/or laryngeal discomfort sensations. (Am Zehnhoff-Dinnesen, Wiskirska-Woźnica & Nawka, 2020). The entire process of sound generation in human phonation is influenced by a complex anatomical system that is constantly modified and adjusted. Any health problem of the human body is reflected in the voice, but especially those that directly or indirectly affect the phonatory apparatus, such as organic dysphonia caused by structural abnormalities (congenital sulcus vocalis, laryngeal trauma), disorders of the auditory apparatus (hearing loss), diseases of the respiratory system (acute rhino-sinusitis, pharyngitis,

acute laryngitis, tracheobronchitis, etc.), problems related to the muscular system and/or the nervous system (paralysis of the vocal cords, Parkinson's disease, myasthenia gravis), the endocrine system (imbalance hormonal, gland conditions: pituitary, thyroid, adrenals, ovaries, testicles) and/or mental balance (psychogenic disorders).

Most dysphonia are caused by laryngeal hypercontraction caused by insufficient respiratory support, vocal technique incompatible with the vocal apparatus, vocal abuse, lack of vocal training, and not warming up the voice before the events held most of the time in spaces with a sound system that leaves desired, where in order to be heard, the singer has to force. Stress, nervousness, poor health, accumulated fatigue, etc., are factors that contribute to favoring laryngeal contraction and vocal problems implicitly. In these cases, decontraction of the laryngeal muscles is indicated through techniques designed to reduce the tension in the larynx and vocal tract. The most frequently used and with very high benefits over time were the humming technique, the yawning/concealed yawning method, and the chewing technique, resonant vocal techniques. The yawning method and the chewing technique are among the techniques that open the vocal tract, allowing easier phonation with a minimum of muscular effort, (Bonne & McFarlane 1993). In the recovery of dysphonic voices, elements, and techniques from singing (originally from classical singing) have been successfully introduced, adapted, and individualized from one patient to another, and it is known that a large part of the therapy techniques used in voice recovery is derived from singing, acting and speech therapy.

Teaching the subject to sing effortlessly, identifying and eliminating by replacing inappropriate respiratory and phonatory habits, restoring confidence in one's abilities, fixing a bodily vocal scheme through practical exercises in accordance with anatomical and neuro-endocrine structures and conducive to correct vocal emission by adopting automated breathing, pitch correction and the realization of an acoustic-verbal automation relationship are just some of the principles that must be considered in the treatment of singing voice disorders.

Method

The present research aims to highlight the visible benefits that voice therapy can bring both as a stand-alone treatment and as an adjunct to surgical and/or drug treatment in the treatment of singing voice disorders, to present the development and application of a model therapeutic based on the resonant technique and to promote the principles of vocal hygiene with a significant role in maintaining the vocal apparatus in an optimal state of health.

The objective of the work Therapy of singing voice disorders is to evaluate the effectiveness of using the principles of vocal hygiene and the eclectic vocal therapy model by combining three resonant vocal techniques: nasalization, the method of concealed yawning, and the chewing technique, in the corrective-restorative vocal therapy program of people with singing voice disorders.

I hypothesized that there is a link between vocal abuse and voice disorders and that vocal dysfunction most often sets in after vocal abuse for various reasons, with/without damage to the structures of the vocal cords, forced to strain for voicing, thus leading to a circle vicious, from which a period of vocal rest (relative or absolute) is needed, followed by vocal recovery. When direct therapy is also accompanied by principles of vocal hygiene with a preventive role, the results are much more effective.

Starting from this hypothesis, in order to demonstrate the usefulness of vocal hygiene principles but also of vocal therapy with a corrective-recuperative role, we performed two evaluations (initial

and final), in which vocal parameters (height, timbre intensity) were evaluated on one hand and the influence of voice problems on the patient's quality of life on the other.

Participants

The sample is represented by a group of 5 dysphonic patients (3F, 2M), aged between 22-62 years, each individual being a representative of one, at most two musical genres (light music, popular music, Byzantine music, genre of opera, choral music). Sample members were selected in the voice therapy office of "Prof. Dr. Dorin Hociota" Institute of Phonoaudiology ENT surgery, Bucharest, Romania, each case including identification data of each participant in the study, the diagnosis given by the phoniatician following the phoniatic consultation, and an image of the stroboscopic examination of vocal cords.

Methods and techniques used in research

The tools used in the research were the following:

1. Anamnesis
2. Tools for evaluating vocal parameters: auditory perceptual analysis, GRBAS score,
3. Aerodynamic analysis: maximum phonation time (MPT)
4. Numerical Pain Rating Scale (NRPS) from 1 to 10, after McCaffery, Beebe, et al. (1989)
5. Tools to assess the influence of voice problems on the patient's quality of life: the VHI scale.

1. Anamnesis

The anamnesis is the discussion with the patient that includes data regarding the reasons for presenting to the consultation, the history of the disease with data on the onset of symptoms, family history, physiological history, pathological history, data on the state of health, if he suffers from GERD, hormonal imbalances or other diseases and if following a treatment plan, data on psychological status, stressors, environmental factors, diet, workplace information, vocal activity schedule, etc.

2. The GRBAS score

GRBAS score - perceptual analysis of hoarseness/dysphonia. It is performed from voice samples, classifying each sample from 0 to 3 (0 = normal, 1 = mild, 2 = moderate, 3 = severe), where:

G (grades) represents the overall quality of the voice, the degree of hoarseness,

R (roughness) represents the sound impression of irregular glottic impulses, abnormal fluctuations in the tonality in the middle register, manifested by a rough, hoarse, irregular sound

B (breathiness) - sound impression of turbulent air leakage through an insufficient glottic closure, which may include short aphonic moments (non-vocal segments). It is most often defined as blown, torn, or veiled.

A (asthenicity) - impression of weakness in spontaneous phonation, weak, hypokinetic or hypofunctional voice, without many overtones

S (strain) - auditory impression of excessive force, strain, or tension associated with spontaneous phonation

3. Maximum phonation time (MPT)

Maximum phonation time (MPT) – is an aerodynamic analysis (explores the respiratory function and the ability of the glottis to let air pass through it) obtained by asking the patient to phonate sustained on the vowel a, being measured with a stopwatch (normal values of MPT according to C.I. Bogdan, 2001: 25-35 seconds in men, 15-20 seconds in women). Pathologically, the MPT values fall below 10 seconds (e.g., paralysis of the vocal cords).

4. Numerical Pain Rating Scale

Some of the singers complain of pain in the neck area either during phonation or after phonation, pain that they categorize differently: itching, stinging, dull pain, claw-like pain, etc.

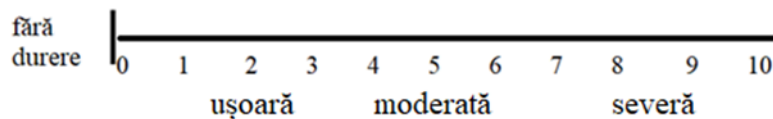
Numerical pain rating scale, according to McCaffery, Beebe et al. 1989:

no pain - 0,

mild pain – 1, 2, 3

moderate pain – 4, 5,6

severe pain – 7, 8, 9, 10.



Numerical pain rating scale, according to McCaffery, Beebe et al. 1989

5. Voice Handicap Index (VHI)

The VHI measures the influence of voice problems on the patient's quality of life. The VHI involves a functional (functional / VHI-F), physical (physical / VHI-P), and emotional (emotional / VHI-E) subscale with 10 sub-questions per category. The patient rates their response from 0 to 4 (0 = never; 1 = almost never; 2 = sometimes; 3 = almost always; and 4 = always), and the total score is calculated between 0 and 120 and for each subcategory between 0 and 40. A low total VHI score (VHI-T: score 0-30) refers to mild voice problems, a score of 30-60 represents moderate-severe disability and a score ranging from 61 to 120 indicates severe voice impairment. The short form with 10 questions was used in the study.

Training procedure

The initial evaluation was applied at the time of the start of the voice therapy, through the anamnesis and the already mentioned tests, followed by a complex therapeutic process in order to recover the phonation, which aimed to eliminate the symptoms and regain the voice function by fulfilling the following therapeutic objectives: optimization of the vocal parameters, elimination pain, combating abnormal postures, re-educating proprioception and sensory stimulation and achieving maximum vocal output with minimum effort.

The final assessment was done 12 weeks after the completion of therapy using the same tests as in the initial assessment.

Voice therapy scheme

The voice therapy scheme that was applied to the 5 patients included exercises that targeted the subsystems involved in voice production: the respiratory apparatus, the phonatory apparatus, the resonance cavities, the articulatory apparatus, and the abdominal muscles. We worked according to the formula awareness - correction - fixation - monitoring, adapting individually according to the needs and abilities of each individual patient, the following exercises:

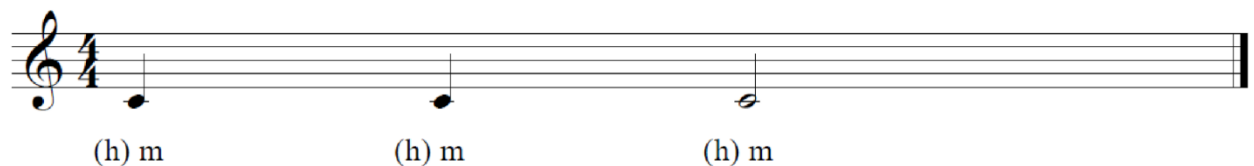
- In front of a mirror, the patient looks at himself, relaxes his shoulders, straightens his back, looks forward, slightly lowers his jaw, and begins the breathing exercises
- breathing exercises and dosage of the expiratory air column, starting from the awareness of the act of breathing with the two times: inhalation and exhalation, warming the palms with

exhalation air, up to complex exercises with inhalation of 4-6 times/seconds and exhalation for 30 - 40 times with/without interspersing the moments of 4-8 times of air retention with the monitoring of the sound air column, trying to be constant both in intensity and frequency.

- exercises to relax and decontract the muscles of the neck and the base of the tongue: the slow movement of the head in the 4 cardinal points (right, left, up, down), slowly lowering and raising the head from one shoulder to the other, yawning, chewing without sounding, latero-occipital massage and along the sternocleidomastoid muscles, slow detachment of the tongue outside the oral cavity in the direction of the 4 cardinal points, sweeping the teeth with the tip of the tongue, inflating and deflating the cheeks, rotating the shoulders forward and backward, etc.
- physical exercises to train the abdominal press for the dosage of exhaled air in order to support the vocal emission (eg: bending the knees on the abdomen)
- impostation exercises (bringing the sound into the face mask) starting from the comfort frequency and using nasalization, the concealed yawning method, and the chewing technique.

The humming technique uses nasal consonants in phonatory practice (Colton et al, 2006) and consists of the nasal voicing of nasal consonants. Examples of nasalization: affirmation (mhm), monotonous sound (hmm), descending nasalization, lullaby, long sigh/moan, jerky, descending sob.

Example of humming technique:



In the continuation of the monotonous nasalization, the vowels are added separately or connected in syllables, sounding on the same comfort frequency until the expiration is completed and ensuring that there is no fluctuation in the emission.

Ex: maaaaaaaaam/meeeeeeeeeem/miiiiiiiiim/mooooooooom/muuuuuuuum/

Ex: mam-mam-mam/mem-mem-mem/mim-mim-mim/mom-mom-mo/mum-mum-mum.

The exercise can be diversified by changing the consonant m with n (only in the initial position) or even with l.

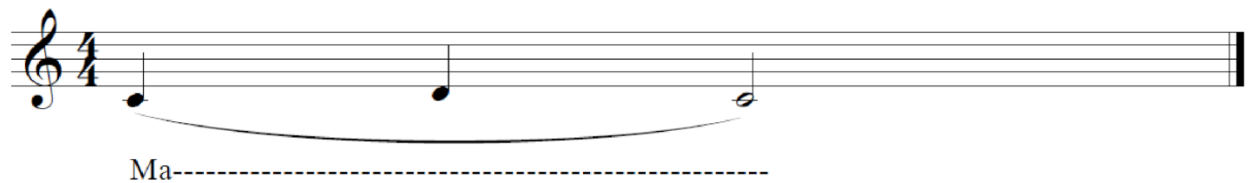
After these exercises to place the sound in the face mask, the diphthongs can be added: oa, uo, ie, as exemplified by C.I. Bogdan (2001, p. 218) when he talks about the descent of the sound from the face mask into the cavity

Ex: mam-ma-oa-oa-oa/mem-me-ie-ie-ie/mom-mo-uo-uo-uo

The yawning method - is widely used in classical singing techniques, it relaxes the vocal tract, by lowering the larynx and widening/opening the pharynx. Bonne (2014) describes this method under the name yawn-sigh and Gîrbea&Cotul (1967), call it the method of concealed yawning and semi-yawning. Basically, a yawning sensation is caused, from which only the first part of the yawn is used, on which the vocalization is built with a gradually descending contour of the perfect fifth (5P), most frequently on the vowel a.

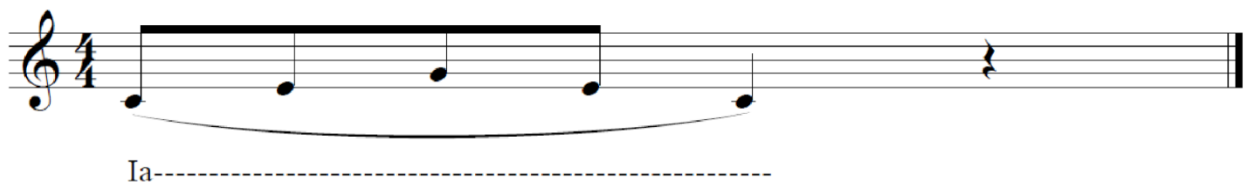


The chewing technique (originally described by Froeschels, 1952) favors the opening of the mouth and the reduction of tension in the mandible and neck muscles, while the voice is placed in front with minimal effort. Like the yawning method, the chewing technique is very accessible; voicing comes naturally, and the only thing left to do is shape the lip contour to your liking. It is preferable to build vowels with gradually ascending contour of a major second (2M), major third (3M), and perfect fifth (5P), starting from the vowels *a* and *o*.

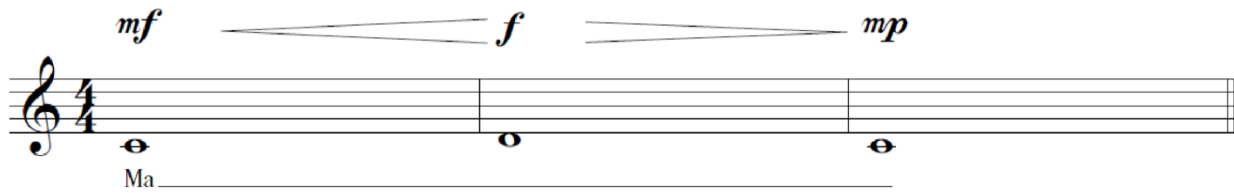


- exercises of monotonous reading of a text (usually the words of a melodic fragment), in which the sounding is aimed at the same frequency (the comfort frequency), maintaining an average intensity throughout the exercise.
- exercises in a monotonous rhythmic reading of the text from the score
- vocalize starting gradually from exercises of low difficulty

Examples of vocal range recovery exercises starting from the comfort register



Example of intensity exercise:



- application on the musical score/melodic fragment.

For better efficiency, a schedule is made together with the patient in such a way that he can practice progressively from one day to the next, adding new elements, in turn, depending on the patient's abilities and assimilation power.

Meeting schedule	Together with the therapist	Without therapist supervision
week I	3 sessions of 15 min/day	3 sessions of 5 min/day
the second week	2 sessions of 30 min/day	4 sessions of 15 min/day
week III	2 sessions/week of 45 min/day each	4 sessions/week of 15 min/day in the first part of the day, respectively 4 sessions of 30 min/day
the fourth week	1 session/week 45 min/day	6 sessions/week of 15 min/day in the first part of the day, respectively 6 sessions/week of 45 min/day
week V-VIII	1 session/2 weeks	6 sessions/week of 15 min/day in the first part of the day, respectively 6 sessions/week of 45 min/day
week IX-XII	1 session/4 weeks	6 sessions/week of 15 min/day in the first part of the day, respectively 6 sessions/week of 90 min/day

Results

Following the analysis of the performed evaluations, the therapeutic effects of the 3 resonant vocal techniques can be observed in each of the 5 subjects involved in the research.

	GRBAS		MPT		Numerical Pain Rating Scale		VHI	
	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest
Subject no.1	G1R0B0A0S0	G0R0B0A0S0	20 sec	30 sec	4	1	21p	4p

Subject no.2	G1R0A0B1S0	G0R0B0A0S0	24 sec	33 sec	6	1	13p	4p
Subject no.3	G1R0A1B1S0	G0R0B0A0S0	16 sec	25 sec	4	1	12p	4p
Subject no.4	G2R0B1A0S1	G0R0B0A0S0	17 sec	25 sec	-	-	23p	2p
Subject no.5	G1R0B1A0S1	G0R0B0A0S0	23 sec	34 sec	-	-	18p	2p

The results of the final evaluation demonstrated the improvement of the vocal parameters in all five cases so that if at the initial evaluation the sounds were hoarse in all cases, muffled (in case study no. 1), incorrectly/falsely intoned (mostly on verse endings or in the passage area) or asthenic (case no. 3), dominating the difficulty in managing shades of intensity, as for example: from p to f-ff in case of study no. 3 and from f to p-pp in studies case studies: 1,2,4,5, with unresolved passage areas (case studies no. 4, 5) and laryngeal voice emission (case studies no. 2-5), respectively tubed (case study no. 1), at the final evaluation, the intonation proved to be clean, fair, without difficulty in performing the nuances, with the homogenization of the sounds throughout the vocal range (resolved passage areas) and with emission previously placed in the mask. The GRBAS score in all cases demonstrates that affected parameters have returned to normal values (value 0). The increase in MPT shows an increase in lung capacity and implicitly the support of respiratory support, the decrease in pain reported in 3 out of 5 cases is translated by the decrease in hypercontraction at the laryngeal level and the decrease in the values of the VHI scale translates into the increase in the quality of life given by the increase in the quality of the voice with the return of the parameter's vowels at normal values.

Discussion

Singing voice disorders represent an important segment of vocal pathology, targeting a niche of professional and amateur singers of all musical genres. A large part of these conditions is behavioral disorders acquired due to vocal maltreatment as a result of overstraining the voice or using the phonatory in an inappropriate and ineffective way.

It is known that a large part of the therapy techniques used in vocal recovery is also derived from singing (originally from classical singing), being adapted, and individualized from one patient to another, which is why the permanent presence of a singing teacher in the team is recommended multidisciplinary assessment and treatment of the dysphonic singer as noted by Dinah Harris (2018).

As other studies have shown (Carding&al, 1997, Hartnick&al, 2017) to improve vocal parameters with changes in vocal fold tissue and improve quality of life, it is recommended that direct voice therapy be administered in combination with indirect voice therapy. Educating the patient about the behaviors and practices that produce vocal cord hypercontraction (which can even be complicated by lesions in the structure of the free edge of the vocal cords), eliminating by replacing the maladaptive/maladaptive behaviors with ones that lend themselves to the singer's physiology, and practicing a training constantly gave good results highlighted by the recovery of the voice quality and implicitly the quality of life. People with voice disorders need to be informed about how they should take care of the vocal apparatus in the future to prevent possible relapses caused

either by repeated vocal abuse or by using a vocal technique that does not lend itself to anatomical, neuromuscular structures and singer neuroendocrine. It is very important that the patient knows his limits and does not exceed them. Some singers only sing at events and then they do it for quite a few hours (4-6 programs of 45 minutes each/night), while others get exhausted from endless rehearsals and have no energy left for the concert.

Finally, it is important to recognize that voice therapy is a complex behavioral intervention and therefore does not lend itself easily to study or analysis. The success rate of voice therapy may depend on factors such as chronicity, nature of etiology, medical history, presence or absence of secondary gains, variability of treatment techniques, duration of therapy, skills, and knowledge of the clinician, the personality of the clinician, client motivation and confidence in treatment, client adherence and the 'burden' of treatment (Carding&al, 1997).

The visible benefits that voice therapy can bring both as an independent treatment and as an adjunct to surgical and/or drug treatment in the treatment of singing voice disorders are known and published in international specialized literature and have also been highlighted in the research of face.

Conclusion

Singing voice disorders are an important segment of vocal pathology, targeting a niche of professional and amateur singers of all musical genres. Many of these conditions are behavioral disorders acquired due to vocal abuse due to voice overload or use of the phonation in an inappropriate and inefficient manner. The aim of this study is to evaluate the effectiveness of using the principles of vocal hygiene and the eclectic vocal therapy model by combining three resonant vocal techniques: humming, the method of disguised yawning and the chewing technique, in the corrective-recuperative vocal therapy program.

It is assumed that there is a link between vocal abuse and voice disorders and that vocal dysfunction occurs most often after vocal abuse for various reasons, with / without affecting the structures of the vocal cords, forced to force for sound, thus leading to a circle vicious which requires a period of vocal rest (relative or absolute), followed by vocal recovery. When direct therapy is accompanied by principles of vocal hygiene with a preventive role, the results are much more effective.

The three resonant therapy techniques: humming technique, yawning method, chewing technique, were applied on a sample of 5 participants (3F, 2B), aged between 22-62 years, each individual being a representative of one, at most of two musical genres (light music, folk music, Byzantine music, opera genre, choral music). In the evaluation process (initial and final) were applied: two tools for assessing vocal parameters (perceptual-auditory analysis, GRBAS score), a tool for assessing pain (NRPS Numerical Pain Assessment Scale) and a tool for assessing the influence of vocal problems on quality of life (VHI Voice Disability Index).

Following the analysis of the evaluations performed, the positive effects of the vocal therapy used in all five case studies were observed. If the initial assessment relates to altered vocal parameters (pitch, intensity, timbre), pain in the laryngeal muscles (three out of five cases) and a negative influence of vocal problems on quality of life, the final assessment found normalization of vocal parameters, decreased pain, and improving the quality of life by lowering the VHI index.

Compliance with the principles of vocal hygiene and constant training play an overwhelming role in the career of the singer, who is often compared to the athlete who, in order to achieve certain performances, needs to adopt a healthy, disciplined lifestyle, with a suitable diet, with the removal

by replacement of harmful habits, vices, with the observance of rest hours and the elimination of any abuse, not only vocal. In addition to these essentials, the singer needs a vocal technique that facilitates his work and lends itself to musical abilities, and anatomical, neuromuscular, and neuroendocrine structures, knowing that training without technique is just as bad if not worse than lack of training.

A very important role in this regard is played by the voice therapist who must be a good model for the patient in all aspects: empathize, know how to listen, advise, know and be able to explain the anatomy and physiology of the vocal apparatus, to know and recognize the pathology of the vocal cords, master the methodology of recovery practices, know how to explain the work scheme to the patient, motivate him and restore his confidence in his abilities. Also, the therapist must have musical skills and knowledge in the field to be able to help the patient with problems in the singing voice and by his own model in exemplifying and performing exercises aimed at bringing the singer back to the level of performance before the problem.

The conclusion is that the use of resonant vocal techniques together with vocal hygiene measures not only give very good results in the vocal recovery of singers but also have a very important role in maintaining the health of the voice and vocal apparatus.

Reference

- Boone, D. R., & McFarlane, S. C. (1993). *A critical view of the yawn-sigh as a voice therapy technique*. Journal of voice : official journal of the Voice Foundation, 7(1), 75–80. [https://doi.org/10.1016/s0892-1997\(05\)80114-6](https://doi.org/10.1016/s0892-1997(05)80114-6)
- Boone D. R. McFarlane S. C. Von Berg S. L. & Zraick R. I. (2014). *The voice and voice therapy*. (Ninth). Pearson.
- Carding, P.N., Horsley, A.,I., Docherty, G., J. (1997). *A study of the effectiveness of voice therapy in the treatment of 45 patients with nonorganic dysphonia*, Journal of Voice, 13 (1), Pages 72-104.
- Constantin, I. B. (2001). *Foniatrie Clinica*, Ed. Viata medicala romaneasca, Bucuresti.
- Verza, E.(2009). *Tratat de Logopedie*, Volumul II, Editura Semne
- Gîrbea Şt., Cotul G., (1967). *Fonoaudiologia, fiziologia vocii vorbite şi cântate*. Bucureşti, Editura Didactică şi Pedagogică.
- Harris, T., Howard, D.M. (2018). *The Voice Clinic Handbook*. Second Edition, Compton Publishing Lnd.
- Hartnick, C., Ballif, C., De Guzman, V., Sataloff, R., Campisi, P., Kerschner, J., Shembel, A., Reda, D., Shi, H., Sheryka Zacny, E., & Bunting, G. (2018). *Indirect vs Direct Voice Therapy for Children With Vocal Nodules: A Randomized Clinical Trial*. JAMA otolaryngology-- head & neck surgery, 144(2), 156–163. <https://doi.org/10.1001/jamaoto.2017.2618>
- Léothaud, G.(2005). *Théorie de la Phonation*. Cours de DEUG 2e aneé, DMU3D1B
- Mureşan, R., Necula, V. (2020). *Principii şi tehnici de terapie vocală*. Ed. Medicală Universitară Iuliu Haţieganu, Cluj-Napoca
- Yiu, E. M., Lo, M. C., & Barrett, E. A. (2017). *A systematic review of resonant voice therapy*. International journal of speech-language pathology, 19(1), 17–29. <https://doi.org/10.1080/17549507.2016.1226953>
- Zehnhoff-Dinnesen, A., Wiskirska-Woźnica, B., & Nawka, T. (2020). *Phoniatrics I : fundamentals, voice disorders, disorders of language and hearing development*. Springer.
- Zhang, Z. (2016). *Mechanics of human voice production and control*. The Journal of the Acoustical Society of America 140, 2614-2635 <https://doi.org/10.1121/1.4964509>