
Voiced lip and tongue trill technique: literature review

Técnica de vibração sonorizada de lábios e língua: revisão de literatura

Técnica de vibración sonora de los labios y la lengua: revisión de la literatura

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Abstract

The voiced lip and tongue trill technique, has broad clinical applicability and use. To better understand their application in vocal clinic, the aim of this literature review was to identify the voiced tongue and lip vibration technique on the classification, main indications, clinical results and technical performance duration. Literature search was conducted in PubMed platform, portal CAPES and Google Scholar search site. There were included original articles, literature reviews, congress proceedings, dissertations and thesis that addressed the sonorous lips or tongue vibration technique, published in the last 10 years, in Portuguese or English. There were excluded books and editorials. Articles whose technique was only cited without approach on immediate vocal or laryngeal effects, forms of use or clinical results were also excluded. Initially, were found 42 publications. After the steps of selection by title and abstract, there remained 20 original articles, 1 literature review and 5 dissertations. The publications analyzed showed that the voiced tongue and lip vibration technique is classified as an exercise of semi-occluded vocal tract, which softens the contact between the vocal folds, balances the subglottal and supraglottal pressure, optimizes the mucus-wave motion and increases vocal resistance. Its main indications are for vocal warm up, occupational use of voice, hyperkinetic dysphonia and mass lesions in the vocal folds.

Keywords: *Voice; Voice Training; Speech Therapy.*

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Resumo

A técnica de vibração sonorizada de lábios e língua tem ampla aplicabilidade clínica e utilização. Para se compreender melhor a sua aplicação na clínica vocal, o objetivo desta revisão de literatura foi identificar a técnica de vibração sonorizada de lábios e língua quanto à classificação, principais indicações, resultados clínicos e tempo de execução. Foi realizada pesquisa bibliográfica na plataforma PubMed, portal de periódicos CAPES e site de busca Google Acadêmico. Foram incluídos artigos originais, revisões de literatura, anais de congresso, dissertações e teses que abordaram a técnica de vibração sonorizada de lábios ou língua, publicados nos últimos 10 anos, em português ou inglês. Foram excluídos livros, resenhas e editoriais. Foram ainda excluídos os artigos cuja técnica foi apenas citada, sem abordagem sobre efeitos vocais ou laringeos imediatos, formas de utilização ou resultados clínicos obtidos. Inicialmente, foram encontradas 42 publicações. Após as etapas de seleção por título e resumo, restaram 20 artigos originais, um artigo de revisão de literatura e cinco dissertações. As publicações analisadas demonstraram que a técnica de vibração sonorizada de lábios ou língua é classificada como exercício do trato vocal semiocluído, suaviza o contato entre as pregas vocais, equilibra as pressões sub e supra glótica, otimiza o movimento muco-ondulatório e aumenta a resistência vocal. Suas principais indicações são aquecimento vocal, uso ocupacional da voz, disfonias hipercinéticas e lesões de massa em pregas vocais.

Palavras-chave: Voz; Treinamento da voz; Fonoaterapia.

Resumen

La técnica de vibración sonora de labios y lengua, tiene amplia aplicabilidad clínica y uso. Para comprender mejor su aplicación en la clínica vocal, el objetivo de esta revisión de la literatura fue identificar las publicaciones en la técnica de vibraciones sonoras de labios y lengua en la clasificación, indicaciones principales, resultados clínicos y tiempo de ejecución técnica. Búsqueda de la literatura se llevó a cabo en la plataforma PubMed, CAPES portal y sitio de Google Académico. Se incluyeron artículos originales, revisiones de la literatura, actas de congreso, disertaciones y tesis que abordaron la técnica de vibración sonora de labios y lengua, publicados en los últimos 10 años, en portugués o inglés. Se excluyeron libros, revistas y editoriales. También se excluyeron los artículos donde la técnica fue sólo citada, sin enfoque en los efectos vocales o laringeos inmediatos, formas de uso o los resultados clínicos. Inicialmente, fue encontrado 42 publicaciones. Después de las etapas de selección de título y el resumen, se mantuvieron 20 artículos originales, 1 artículo de revisión de la literatura e 5 disertaciones. Las publicaciones analizadas mostraron que la técnica de vibración sonora de labio y lengua se clasifica como ejercicio de tracto vocal semi-ocluido, que suaviza el contacto entre las cuerdas vocales, equilibra la presión subglótica y supraglótica, optimiza el movimiento de la onda mucosa y aumenta la resistencia vocal. Sus principales indicaciones son el calentamiento vocal, los profesionales de la voz, la disfonía hipercinéticas y las lesiones de masas en las cuerdas vocales.

Palabras claves: Voz; Entrenamiento de la Voz; Logoterapia.

Introduction

Voice therapy is the most common modality in the treatment of dysphonias. It is generally used in combination with surgical or pharmacological treatment when not used as a primary treatment. The speech and language therapist must include in the patient's therapeutic plan teaching of the vocal physiology and physiopathology as well as guidelines on vocal health and reduction of exces-

sive vocal behavior. In addition to the definition of the objectives and the choice and model of the specific vocal techniques for each case, the professional is also responsible for developing vocal self-perception and stimulating motivation in the patient's voice.¹⁻⁴

The set of application modalities of a vocal exercise used for a specific purpose is called vocal technique. This must be based on a method and on well-established anatomical and functional data.² The evaluation of the immediate effect of a certain

vocal technique seeks to understand physiological modifications of the phonation mechanism in order to obtain an important role in the confirmation of the most efficient techniques in a certain type of voice change or behavior.³

The vibration technique has two basic modalities, which correspond to the lip vibration (VLVT) and tongue vibration (VTVT), both with the objective of mobilizing the mucosa of the vocal folds, balancing the pneumophonoarticulatory coordination, reduce phonatory effort and provide vocal warm-up. They can be performed in the normal tone or with variations of frequency and intensity. Also, it can be widely used with various voice modification possibilities. It is called a universal technique by some authors⁵⁻⁷ due to the overall modifications in the voice quality provided by the technique, and it can be used in hypofunctional and hyperfunctional dysphonias, depending on the chosen variation.^{2,5,6,8,9}

In this perspective, this study had the objective of analyzing the existing updated literature on the voiced lip and tongue vibration technique, identifying its classifications, principal indications, clinical results and performance duration.

A bibliographic research was conducted using the PubMed platform, the CAPES journal portal and the Academic Google site. The terms used in

the search were: “lip trill”, “tongue trill” and “lip and tongue trill”. The collection occurred in the months of November and December of 2015 at the Federal University of Pernambuco. It included original articles, literature reviews, congress proceeding, dissertations and theses in Portuguese or English, with publication date as from 2005, with the exclusion of books, editorials, reviews and case studies, or articles that only cited vibration technique.

There was an initial selection of 42 studies. Only 26 publications remained after the analysis of the inclusion and exclusion criteria, and these addressed the technique in relation to the classification, objectives, use or clinical results. Regarding the findings for the analysis of this review, a total of 12 articles and five dissertations were obtained. The other productions, due to not contemplating the variables of the technique chosen for the analysis of this study, comprised the introduction and discussion of the findings, as shown in Figure 1.

As shown in Table 1, the articles and dissertations analyzed presented different specific methodologies with important variations of sample, instruments used for evaluation and application of the techniques, hindering the detailed analysis of its results and the comparison between the publications.

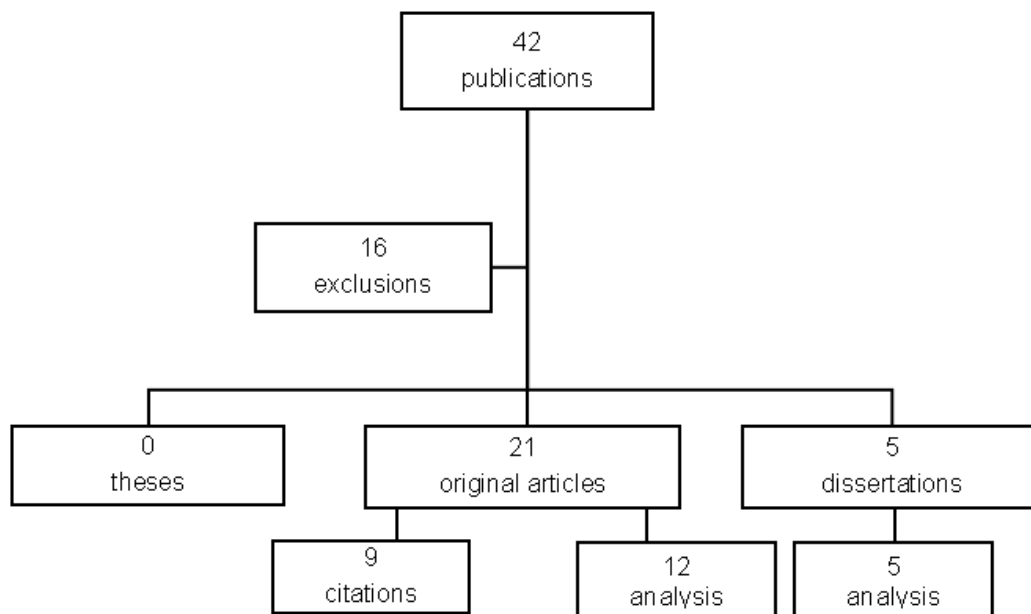


Figure 1 – Fluxogram.

Table 1. Results from studies

Author	Year	Publication type	Aim of the study	Sample	Techniques discussed	Assessment tools	Classification	Main Indications	Performance	Results
Menezes, MH Duprat, AC Costa, HO	2005	Article	Evaluation before and after the technique application	N – 30 Male and female No history of dysphonia	VTVT	Vocal evaluation Laryngoscopy	None	Professional voice	7 minutes	Better outcomes as from the third minute performance time for women Better outcomes as from the fifth minute performance time for men
Bueno, TC	2006	Dissertation	Evaluation before and after the technique application	N – 20 Speech pathologist Female No vocal complaints or voice disorders	VTVT	Vocal evaluation Acoustic evaluation Laryngoscopy	Universal technique Method of emission-emission-facilitating sounds	Nodules Cyst Reinke's edema Dysphonia with limited mucosal wave Incomplete glottal closure	90 seconds	Milder glottal attack Whole vibration of the larynx box during the technique Improvement of the spectrographic trace Enhancement of harmonics
Schwarz, K	2006	Dissertation	Evaluation before and after the technique application	N – 24 Female No vocal complaints	VTVT	Vocal evaluation Acoustic evaluation Laryngoscopy	Method of emission-emission-facilitating sounds	Mucosal pathology Incomplete glottal closure Children dysphonia Vertical partial laryngectomies Dysphagia Professional voice Vocal warm-up	3 sets of 15 repetitions with 30 seconds intervals	Improvement of voice type, focus of vertical resonance and improvement of spectrographic evaluation parameters Increased f ₀ Improvement of medial vestibule constriction according to increase in VTVT duration
Gaskill, CS Erickson, MI	2008	Article	Evaluation before, during and after the technique application	N – 25 Male No history of dysphonia	VLVT	Vocal evaluation Electroglottography	SOVTE	Vocal warm-up Hyperfunctional dysphonia	1 minute	Reduction in vocal fold closed quotient, with a more pronounced change in non-singers



Author	Year	Publication type	Aim of the study	Sample	Techniques discussed	Assessment tools	Classification	Main Indications	Performance	Results
Schwarz, K Cielo, CA	2009	Article	Evaluation before and after the technique application	N - 24 Female No vocal complaints or voice disorders	VTVT	Vocal evaluation Acoustic evaluation Laryngoscopy	None	Different types of laryngeal diseases	3 sets of 15 repetitions with 30 seconds intervals	Improvement of voice type, focus of vertical resonance and improvement of spectrographic evaluation parameters Increased f ₀ Improvement of medial vestibule constriction according to increase in VTVT duration
Pereira, EC	2009	Dissertation	Evaluation before and after the technique application	N - 32 Female Normal to mild dysphonia	VLVT VTVT Nasal sound technique Overarticulation technique	Vocal evaluation Acoustic evaluation Layingoscopy Vocal self-evaluation	Method of emission-facilitating sounds	Acute laryngitis Nodules Reinke's edema Mucosal scars Sulcus vocalis Vocal warm-up	6 times each + 6 times each in siren + 6 times each in the tune of "Happy Birthday To You"	Improvement of vocal quality Reduction of vocal effort Favoring glottal closure Improvement of mucosal wave movement Improvement in pneumophonoartulatory coordination
Cordeiro, GF	2010	Dissertation	Evaluation during the technique application	N - 10 Singer Male and female No vocal complaints or laryngeal disorder	VLVT VTVT	Stroboscopy Electroglottography	Universal technique Method of emission-facilitating sounds	Hypo or hyperfunctional dysphonia Professional voice Vocal warm-up	-	Better amplitude of cordal vibration with VLVT e VTVT Increased in contact quotient with VLVT e VTVT Higher contact quotient with VLVT in the strong intensities
Azevedo, LL et al	2010	Article	Evaluation before and after the technique application	N - 43 Female No vocal complaints or history of dysphonia	VTVT	Vocal evaluation Acoustic evaluation	None	-	5 minutes (1 + 2 + 2)	Intensity increased as from 1 minute f ₀ increased as from 3 minutes VTVT was more effective as from 3 minutes
Pereira, EC et al	2011	Article	Evaluation before and after the technique application	N - 32 Female Normal to mild dysphonia	Vibrant sound technique Nasal sound technique Overarticulation technique	Vocal evaluation Acoustic evaluation Laryngoscopy Vocal self-evaluation	None	-	6 times each + 6 times each in siren + 6 times each in the tune of "Happy Birthday To You"	Improvement of mucosal wave movement Improvement of jitter and shimmer Complete glottal closure Improvement of voice quality



Author	Year	Publication type	Aim of the study	Sample	Techniques discussed	Assessment tools	Classification	Main Indications	Performance	Results
Zimmer, V	2011	Dissertation	Evaluation before and after the technique application	N – 68 Female No vocal complaints and laryngeal disorders	VTVT	Acoustic evaluation	Universal technique SOVTE	Mucosal pathology Professional voice Vocal warm-up	3 sets of 15 repetitions with 30 seconds intervals	Positive results in vocal tract with less than 3 minutes Results in glottal source as from 3 minutes
Menezes, MH et al	2011	Article	Evaluation before and after the technique application	N – 27 Female Vocal nodules	VTVT	Vocal evaluation Acoustic evaluation	SOVTE	Nodules Laryngeal postoperative Presbyphonia Paralysis Professional voice Vocal warm-up	7 minutes	Positive response predominance at 5 minutes Vocal fatigue at 7 minutes
Pimenta, RA et al	2013a	Article	Evaluation before and after the technique application	N – 30 Male and female No laryngeal disorders	VLVT or VTVT Vocal fry	Vocal evaluation Acoustic evaluation High-speed kymography	None	Benign vocal fold masses Professional voice	Male for 5 minutes, with an average of 20 vibrations Female for 3 minutes, with an average of ten 10 vibrations	Decreased jitter in both genders Decreased shimmer in female Decreased contact quotient
Pimenta, RA et al	2013b	Article	Evaluation before and after the technique application	N – 15 Male and female No history of dysphonia	VLVT or VTVT	Vocal evaluation Acoustic evaluation High-speed kymography	SOVTE	Vocal warm-up Dysphonia	Male for 5 minutes, with an average of 20 vibrations Female for 3 minutes, with an average of ten 10 vibrations	Soft contact in vocal fold vibration Decreased speed quotients Decreased closing quotients Increased opening quotients

Author	Year	Publication type	Aim of the study	Sample	Techniques discussed	Assessment tools	Classification	Main Indications	Performance	Results
Andrade, PA et al	2014	Article	Evaluation during the technique application	N – 23 Male and female	Phonation into straw VLVT VTVT	Acoustic evaluation Electroglottography	SOVTE	Professional voice	4 seconds	Decreased contact quotient
								Vocal fatigue Vocal folds paresis by recurrent nerve injury		Reduced mean value of contact quotient during VLVT
Cordeiro, GF et al	2015	Article	Evaluation during the technique application	N – 10 Singer Male and female	LaxVox Humming Hands-over-mouth exercise	Stroboscopy Electroglottography	SOVTE	Nodules	MFT	Increased f_0 Massage effect on the vocal organs
								Hyperfunctional dysphonia Edema Vocal fold postoperative		Improvement of interaction between the source and the filter Vocal fold massage Variable in amplitude of the electroglottographic signal
Dargin, TC Searl, J	2015	Article	Evaluation before and after the technique application	N – 4 Singer Male and female	Phonation into straw VLVT VTVT	Aerodynamic measurements Electroglottography	SOVTE	Vocal warm-up	2 minutes	Increased sound pressure level and air flow
								Hyperfunctional dysphonia		Increased in contact quotient Decreased of laryngeal resistance after VTVT Variability within and across participants
Dargin, TC DeLaunay, A Searl, J	2016	Article	Evaluation during the technique application	N – 4 Singer Male and female	Phonation into straw VLVT VTVT	Stroboscopy	SOVTE	Vocal warm-up	3 sets of MFT	Decreased in medial vestibule constriction Decreased in pharyngeal constriction Reduced phonatory effort during VTVT Increased vibration amplitude
								No history of dysphonia or laryngeal disorders		

VLVT – Voiced lips vibration technique
 VTVT – Voiced tong vibration technique
 N – Number of participants
 f_0 – Fundamental frequency
 SOVTE – Semi occluded vocal tract exercises
 MFT – Maximum phonation time

With the objective of making this review more didactic, the results are available under the following topics: classification, principal indications, clinical results and performance duration of the technique.

Classification

Although it is also classified as vibrating sound technique, included in the emission-facilitating sounds method,^{2,3,5,6} majority of the studies included the sonorous vibration technique in the Semi-Occluded Vocal Tract Exercises (SOVTE) that promote partial occlusion of the vocal tract during its execution.⁹⁻¹³

The following are also considered SOVTE: resonance tube phonation, phonation into straw, humming, nasal consonants, hand-over-mouth, sonorous fricatives, finger kazoo, among others.^{7,9-20}

Despite this, the review study showed that sonorous lip or tongue vibration and the resonance tube phonation were the most studied techniques.²¹

Emphasis was laid on the study that proposed the division of the SOVTE into two large groups: Stable and fluctuating, considering the physiological differences. In the stable group (hand-over-mouth, humming and phonation into straw techniques), there is only one primary vibration source (vocal folds), which when associated to the constant partial obstruction of the vocal tract provides high positive reactance and consequent fluid phonation. In the fluctuating group (VLVT, VTVT and LaxVox – silicon resonance tube phonation in container with water), characterized by the presence of two sources of vibration (vocal folds and lip, tongue or water), the second promotes a “massage effect” on the vocal tract that creates lower positive reactance and less fluid phonation compared to the first group.¹⁵ However, the use of this proposed division was not observed in other studies.

Principal indications

The SOVTE are used in large scale, especially due to the direct action of modifications in the sound source, vocal tract transmission and in the interaction of both.¹⁰ Its application has the objective of saving energy, reducing mechanical trauma and normalizing vocal intensity, thus obtaining resonant

vocal quality, with efficient and soft vibration of the vocal folds.¹¹

The main reason for using vocal exercises that increase the supraglottal pressure and thus reduce the transglottal pressure is the possibility of obtaining a more economic and efficient voice sensation, that is, maximum potential with minimum effort.¹² In occupational dysphonia, this relationship becomes indispensable considering that a voice must be produced with the necessary intensity and minimum mechanical trauma possible in the vocal folds.¹⁰ The same applies to cases of vocal abuse resulting from very strong intensity.¹³

The SOVTE are generally applied in hyperfunctional dysphonias, however, they have shown to be efficient in the therapeutic work for vocal warm-up and improvement, hypernasality and laryngeal hypofunction.²¹

With regard exclusively to sonorous lip and tongue vibration, one study stated that 60% of the American speech and language therapists used this technique on patients with dysphonia resulting from muscle tension because they considered it efficient in reducing the hyperfunction. Therefore, the lip or tongue trill comprises one of the most widely used techniques in vocal clinic, especially in hyperkinetic dysphonia.⁴ Various authors also defend its use in vocal fold mucosal pathologies.^{2,7,8,22}

The articles analyzed in this literature review did not mention contraindications of the lip and tongue vibration technique. However, despite the established use in vocal clinic in practically all types of dysphonia (hypo or hyperfunctional),^{2,5,6,8,9} there is record of it not being used in acute inflammatory conditions and immediate laryngeal postoperative.²² On the other hand, and according to the aforementioned, other authors suggest its indication in acute laryngitis, flu or colds, as well as after vocal fold surgery.^{2,3,23}

In clinical practice, the VTVT and VLVT are used alone, in combination, associated to other techniques or included in specific rehabilitation programs.

The Comprehensive Voice Rehabilitation Program (CVRP) for conditions of behavioral dysphonia has the objective of improving the vocal production and the quality of life of the individual in relation to voice.²⁴ In this perspective, the authors defended that the development of specific therapeutic protocols like the CVRP provided clinical practice based on evidences and potential

reproducibility in other scenarios. Emphasis on the VLVT and VTVT techniques is observed in this protocol, considering their frequency in the six proposed sessions, in addition to being oriented in the daily exercises.

Many studies prove the efficacy of the VLVT and VTVT with regards to immediate vocal and/or laryngeal effects.^{3,5,7,8,16-18,26-30} However, the analysis of its effectiveness in vocal clinic is scarce.⁹

Results

The SOVTE modify the acoustic impedance and generate retroflex resonance capable of repelling the vocal folds during vibration, reduce the risks of phonation trauma, balance the sub and supraglottal pressures and promote vocal economy.²¹

The voiced lip and tongue vibration increase the impedance of the vocal tract, resulting in inertia of the internal air column called inertive reactance, which favors the vibration of the vocal folds.¹⁰ Impedance exercises in the vocal tract increase loudness (impression of intensity) without vocal overload or intense glottal closure.¹⁵ This impedance affects the glottal closure pulse and modifies the oscillatory characteristics of the vocal folds.⁵ The VTVT also helps release the tension of the pharynx, reducing the phonation effort due to the promotion of intense vibration in the entire cartilaginous skeleton.¹²

The “massage effect” obtained through the VTVT and VLVT results from the modification of the intraoral pressure, which mobilizes the tract and vocal folds in soft vibration, relaxing the excessive muscle tension, besides improving the circulation of the fluid in the tissue.^{5,19,25}

For didactic purposes, the main studies that analyzed the VLVT and VTVT are mentioned below by chronological order of publication.

The first analyzed the VTVT under the aspects of the acoustic effects and images of the vocal tract in speech pathologist without vocal complaints. The technique was executed for one minute and thirty seconds during the execution of the nasolaryngofibroscoy. The results neither showed improvement of the glottal closure nor modification of the fundamental frequency; however, there was increase in harmonics and significant improvement in the spectrographic trace. Therefore, the author concluded that the VTVT in her study population

showed results different from that in literature especially regarding glottal closure.⁶

The immediate vocal effects of the SLVT in the elderly were observed in another research, which was also executed in one minute and thirty seconds. The parameters voice, resonance, pitch (impression of frequency), loudness and articulation were evaluated, favoring the glottal coaptation and balance between aerodynamic forces of the respiration and myoelastic forces of the larynx. The findings showed that the voices of the participants improved, especially in terms of loudness and vocal quality.²⁷

The VLVT also interferes in the coefficient of glottal closure, observed through the electroglottography (EGG) in opera singers. The authors considered the lip vibration the only vocal exercise that caused rapid alternation of occlusal and non-occlusal position of the lip without tone modification. This event creates an additional vibration frequency lower than that of the vocal folds, which is capable of modifying the air pressure in the vocal tract and balancing the subglottal pressure and the air flow required for soft vocal emission. During the VLVT, the coefficient of glottal contact reduced from 40% to 50% compared to normal phonation, thereby confirming the role of the exercise in the reduction of the glottal adduction.¹⁶

Despite this, in another study also conducted with opera singers, the authors analyzed the coefficient of glottal contact during lip trill, tongue trill and vocal emission /ε/ through EGG. The authors concluded that the oscillations in the glottal contact quotient were similar in the two sonorous vibration techniques at normal intensity.⁵ However, when conducted at high intensity, the VLVT showed superior contact coefficient.^{5,18}

Another study with the objective of analyzing the immediate effect of the application of three associated vocal techniques, including lip and tongue trills, showed that these techniques were effective in normal or slightly altered female voices, also capable of providing significant immediate improvement in vocal quality and glottal configuration.^{3,26}

Besides using the voiced lip and tongue vibration techniques in association with the nasal sounds and overarticulation, without dissociated records or analyses, the authors observed better results in the evaluated vocal parameters during sustained vowel compared to articulated speech. They argue that this difference was caused by the action of the vibration technique, which promoted improved mucosal

wave movement of the vocal folds, thereby directly influencing sound production at glottal level, in detriment to the modifications in the vocal tract necessary for the effective improvement of voice quality during the articulated speech.²⁶

One of the studies was developed to identify the immediate effects of the sonorous vibrations (lip or tongue) and the vocal fry in healthy individuals.²⁸ In this research, the participants chose either the VLVT or VTVT according to their ability in performing the technique. The authors highlighted significant changes in the jitter reduction in both genders and shimmer reduction only in women. This data indicates immediate effect of the sonorous vibrations with lower average voice signal disturbance in relation to the variation in frequency and amplitude. As a result of the vibration technique, they observed reduction of the phonation effort, increase in voice production efficiency and soft contact between the vocal folds, also in females.

Based on these results, the authors suggested the use of the sonorous vibration technique in therapeutic objectives to improve vocal resistance, provide more periodic vibrations and soften the contact between vocal folds, able to be used in both patients with benign vocal fold masses and in individuals with occupational use of the voice.²⁸

This same study identified the immediate effects of the sonorous vibrations in healthy vocal folds through high-speed kymograph analysis. The authors analyzed the vocal folds according to the time of the kymograph phases (opening, open, closing and closed), calculating the closing, opening and speed coefficients. The results showed significant changes in the vibration standards of female vocal folds with reduction in approximation speed of the mucosa and the time in which they remain closed, as well as increase in the time they remain open. Therefore, they identified the soft contact between the vocal folds as an immediate effect of the sonorous vibrations (lip and tongue) in healthy female voices. Similar results were observed in males. Therefore, the use of the voiced lip or tongue vibration technique in vocal therapy provided changes in the behavior of the vibrating standards of vocal folds, with reduction of mechanical trauma of tissues during phonation.¹⁷

A study was recently published showing that phonation into straw, VLVT and VTVT provided aerodynamic and laryngeal modifications immediately after performing the exercises on four

opera singers, reducing the immediate impact on the laryngeal function with consequent vocal economy.¹⁹ At another time, through the same sample, the authors compared the modifications in the laryngeal activities generated from each technique.²⁰ Despite the benefits observed during the intervention, different individual results were observed among the participants, with the impossibility of comparing and defining the most efficient among the three techniques. Notwithstanding, some records alone showed that VLVT and VTVT showed higher number of positive responses in participants in detriment to phonation into straw, with notable reduction of phonation effort during their performance.²⁰

Performance duration

Another important aspect regarding the vocal exercises is the ideal performance duration of the techniques. Some negative effects caused by the performance duration of the exercises may characterize vocal fatigue,⁹ compromise the expected performance and even cause damages to the voice of the individual.³⁰ Therefore, the performance duration of the vocal techniques should be based on studies that provide knowledge on the ideal duration for its performance.²⁹

One study analyzed the vocal and laryngeal effects of VTVT according to its performance duration in adults of both genders with no history of dysphonia.²³ Vocal and laryngeal records were made before performance of the technique and after the first, third, fifth and seventh minutes. The authors observed different responses between the genders. The women showed better vocal results from the third minute while the men only showed better results as from the fifth minute. Both men and women referred to increased negative sensations from these durations. Regarding the laryngeal aspects, the significant results occurred as from the third minute, characterized by the increase in amplitude of mucosal vibration in men and improved glottal closure in women.

The authors concluded that the performance duration of the VTVT interfered directly in the vocal results and must be carefully considered as a therapeutic resource. Therefore, they suggest that this technique should be applied for a maximum duration of three and five minutes in women and men, respectively.

On the other hand, other researchers observed the efficacy of VTVT in relation to vocal and laryngeal impact and to sensations resulting from its performance, correlating them to the duration of the exercise.^{8,30} Therefore, three sets of 15 repetitions of VTVT were applied during maximum individual phonation time, with intercalated rest of 30 seconds. The results considered that the application promotes vocal and laryngeal modifications, confirming the efficacy of the technique on the glottal source and resonant filter in women without vocal complaints. Furthermore, there was increase in fundamental frequency, improvement of broad and narrow-band spectrograms and of the glottal closure, in addition to higher vibration amplitude and symmetry of the vocal folds.

The authors reinforced that the improvement of the vertical resonant focus, reduction of noises of the laryngeal signal spectrum and increased number of harmonics observed resulted from the potential voice projection upward and outward provided by the technique. They also highlight positive sensations in 58% of the participants in addition to significant improvement of the medial constriction of the vestibule in all subjects, according to the increase in performance duration of the technique.³⁰

Similarly, another study described the sonorous tongue vibration duration and vocal quality in women without vocal or laryngeal changes.⁷ The participants of this study also conducted the three sets of 15 repetitions during maximum comfortable phonation time, with normal tone and intensity and 30 seconds of passive rest between each set. The results showed increase in f_0 and its stability (vf_0); improvement of jitter and noise-harmonics ratio (NHR) in three minutes of performance, as well as significant positive results in the broad and narrow-band spectrograms and the predominance of positive sensations. The findings reinforced that VTVT provided positive results in glottal source as from three minutes of performance and in the vocal tract even before this time.

Women without laryngeal or vocal changes participated in the short term study that had the objective of verifying the ideal performance duration of the VTVT necessary to interfere in the disturbance measurements of the vibratory cycle of the vocal folds, the fundamental frequency (f_0) and vocal intensity.²⁹ As results in relation to the performance duration of the technique, the

performances obtained were specific in terms of the parameters analyzed, namely: increase in f_0 as from three minutes, increase in vocal intensity as from one minute, and reduction of the noise only as from the third minute. At the end of the study, the findings suggest that the ideal performance duration in speech and language therapy practice is three minutes, relating it to the effective improvement of the studied parameters.

In women with vocal node and mild to moderate degree of dysphonia, there was record of effective responses at five minutes of application of the technique characterized by the predominance of positive results like better vocal quality, reduced hoarseness, soprosity and noise, as well as pitch elevation, fundamental frequency (f_0) and levels of glottal to noise excitation ratio (GNE). On the other hand, it is recorded that the performance of VTVT for seven minutes caused increase in tension and signs of vocal fatigue, demonstrating excessive performance duration of the technique. Therefore, they concluded that the performance duration of VTVT in women with dysphonia interfered in the results, especially by muscle and functional adjustments, which modify the tension points of the vocal folds, improved their vibration regularity, redistributed the air pressure and reduced the friction in the region of the nodules.

Conclusion

The main results obtained from this review were:

- The classification of the sonorous lip and tongue vibration technique as semi-occluded vocal tract exercise.
- The ideal performance duration of the exercise for three minutes in both genders; or three sets of 15 repetitions with intervals of 30 seconds in women.
- The use of the technique provides: softening of the contact between the vocal folds; reduction of phonation effort; relaxation of the excessive muscle tension; balance of the subglottal and supraglottal pressures; pneumophonoarticulatory coordination; mobilization of the mucosa of the vocal folds; improvement of the mucosal wave movement; vibration periodicity; improvement of the circulation of fluid in the tissue of the vocal folds; greater vocal resistance; and reduction of the risk of phonation trauma.

- The voiced lip and tongue vibration technique has as principal indications the occupational use of the voice, vocal warm-up, hyperfunctional dysphonias and benign vocal fold masses.

The eminent need for physiological bases related to the use of the vocal techniques has gradually increased the researches to establish its efficiency. Nevertheless, there are important gaps regarding the use of the lip and tongue vibration techniques in vocal clinic. The empirical basis is being conducted in order to analyze vocal and laryngeal modifications through accurate and controlled scientific evidences in specific and well-defined clinical situations, such as in patients with phonotraumatic lesions.

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