



Universidade de Évora - Escola de Artes

Mestrado em Música

Área de especialização | Interpretação

Dissertação

Vocal Exercises and Specific Techniques for Professional Singers in the Period of the Menopause

Isobel Catriona Barton Reis

Orientador(es) | Liliana Margareta Bizineche

Évora 2025





Universidade de Évora - Escola de Artes

Mestrado em Música

Área de especialização | Interpretação

Dissertação

Vocal Exercises and Specific Techniques for Professional Singers in the Period of the Menopause

Isobel Catriona Barton Reis

Orientador(es) | Liliana Margareta Bizineche

Évora 2025



A dissertação foi objeto de apreciação e discussão pública pelo seguinte júri nomeado pelo Diretor da Escola de Artes:

Presidente | Gonçalo Pescada (Universidade de Évora)

Vogais | Carlos Alexandre Mourão de Carvalho e Damas (Universidade de Évora)
(Arguente)
Liliana Margareta Bizineche (Universidade de Évora) (Orientador)

Dedication

This thesis is dedicated to my late mother and father, Anthony M. Barton and Joan Mary E. Barton. Without them, none of this would have been possible.

Acknowledgements

I would like to express my deepest appreciation to my teacher and supervisor, Prof. Liliana Bizineche for her kindness and professionalism as well as to all my dear teachers who I have learnt so much from.

I am also very grateful to Nora Daley-Peng, Joan Melo and to my colleague, Ana Moreira, for their editing help, late-night feedback sessions and moral support. And to Andres Feliu for his precious advice.

Lastly, I would be remiss to not mention my family, especially my husband Luis Conceição, my son, James Reis, and my sister, Fiona Dennison, who have kept me motivated through the hardest of times.

I also wish to mention my Caju, Luzinha, Elf and Touriga, who waited patiently for me hours at a time.

I thank you all.

Resumo

As fases da Menopausa podem ser um desafio para qualquer Mulher. As cantoras profissionais não são uma exceção. Não têm apenas de lidar com os sintomas físicos gerais causados pela questão hormonal, mas também outras questões relacionadas concretamente com a Voz podem causar problemas variados. Até à década de 80 do século XX, muito pouca literatura existia relativa a este tópico. A partir daí assistimos a um florescer de pesquisa científica nesta área. Embora estes académicos que se dedicaram sobre efeitos da Menopausa em cantoras se tenham debruçado acerca da parte científica do processo, pouca clarificação foi dada no que respeita a exercícios vocais que poderiam ser utilizados por profissionais do canto para lidar com essa fase tão delicada na vida de uma Mulher. A dez especialistas em Voz (três cantoras profissionais, três professores de técnica vocal e quatro terapeutas da Voz) foram enviadas gravações de uma série de exercícios, cientificamente aprovados para combater o envelhecimento da Voz, solicitando em questionário se tinham conhecimento dos mesmos, se os utilizavam nas suas práticas regulares e por fim, se poderiam recomendar alternativas a estas propostas. O resultado da investigação demonstrou que os exercícios foram reconhecidos e a maioria utilizados na atividade destes profissionais, embora nem sempre contextualizados com a menopausa especificamente. Apenas uma cantora profissional reconheceu e confirmou o uso de todos os exercícios no seu aquecimento vocal. As restantes inquiridas reconheceram os exercícios, mas não sugeriram recomendações. Este estudo demonstra que existem exercícios e técnicas que podem ajudar no tratamento e manutenção da Voz na Menopausa. No entanto são maioritariamente utilizados para outros problemas vocais (em terapia vocal) e como manutenção no ensino do canto. As cantoras profissionais necessitam de mais conhecimento nesta área para identificar procedimentos que possam auxiliar efetivamente nesta fase da sua Vida.

Palavras-chave: menopausa, cantora profissional, exercícios vocais, técnica vocal, hormonas

Abstract

The phases of Menopause can be a challenge for all women. Female professional singers are no exception. Not only may they have to deal with the general physical symptoms caused by the waning hormones, other symptoms related to their voice production may also become an issue. Before the 1980's very little relevant literature existed on this topic. From this date onwards, a boom in research in this area ensued. Although scientists and academics alike have made head way in this research, little clarity surrounds what kind of vocal exercises or techniques a female professional singer should adopt to cope with menopausal symptoms regarding the voice. Ten vocal specialists, (three female professional singers, three vocal teachers and four voice therapists), were sent a recording of a set of vocal exercises, scientifically identified as adequate for the aging voice, the menopausal voice and /or other pathologies and surveyed regarding their knowledge of and about these exercises, whether they utilized the same in their own regimens, and lastly if they could recommend any other beneficial exercises or techniques. The results of the survey indicated that all examples shown were recognized, and almost all used in their entirety by the voice therapists and singing teachers, albeit not primarily for their role in treating the menopausal voice. Only one professional singer recognized and confirmed the use of all exercises in her warm-up. No recommendations whatsoever were made by two singers with regards to other beneficial exercises. They stated they did not know. The implications of this study show that exercises and techniques do exist to treat and maintain the menopausal singing voice. However, they are generally used primarily for other vocal problems, (in vocal therapy), and as general maintenance in singing teaching. Female professional singers need more knowledge in this area to identify exercises and techniques that could be beneficial for this phase in their life.

Keywords: menopause, female professional singer, vocal exercises, vocal technique, hormones

Table of Contents

Introduction.....	1
Chapter 1: Objectives and Intentions	3
Chapter 2: Literature Review.....	4
2.1: Phases of the Female Hormonal Cycle	8
2.1.1: Before Menopause – Menstruation	8
2.1.2: Perimenopause	10
2.1.3: Menopause.....	11
2.1.4: Post Menopause.....	12
2.2: Exercises and Techniques Possibly Adequate for the Menopausal Voice	13
2.2.1: Semi-occluded Vocal Tract Exercises.....	13
2.2.2: Dr. Joseph C. Stemple VFE – Vocal Function Exercises.....	16
2.2.3: Messa di Voce	19
Chapter 3: Methodology	22
3.1 Questionário para Cantoras Profissionais	23
Secção 1 / Section 1.....	26
Secção 2 / Section 2.....	27
3.2 Questionário para Terapeutas da Voz.....	29
Secção 1 / Section 1.....	32
Secção 2 / Section 2.....	33
Secção 3/ Section 3.....	35
3.3 Questionário para Professores de Canto	36
Secção 1 / Section 1.....	39
Secção 2 / Section 2.....	40
Secção 3 / Section 3.....	40
Secção 4 / Section 4.....	43
Chapter 4: Discussion and Analysis of the Survey Results	44
4.1: Female Professional Singers	44
4.2: Voice Teachers.....	46
4.3: Voice Therapists	49
Chapter 5: Recital.....	50
Chapter 6: Conclusion.....	51
Bibliography.....	53

List of Figures

Figure 1: General menopause symptoms in female professional singers..... 44

Figure 2: Vocal slide on “Knoll” – Highest to lowest resonance 45

Figure 3: Are these exercises beneficial during menopause? 45

Figure 4: Do you teach professional female singers?..... 47

Figure 5: “Knoll” form middle C to G on sustained note..... 50

List of Abbreviations

CTs	Crico-Thyroids
HRT	Hormone Replacement Treatment
LMTVT	Lessac-Madsen Resonant Voice Therapy
SOVT	Semi-occluded Voice Tract
TA	Thyroarytenoid Action
VFE	Vocal Function Exercises

Introduction

The menopausal transition is perhaps one of the less desired phases in a woman's life, especially in the Western world. As women sail through their thirties and on into their fourth decade, the notion that menopause is inevitable slowly begins to become apparent. Perimenopause, the initial phase of the menopause, can last up to 10 years. This is followed by the menopause itself, a phase where a complete cessation of menstruation occurs, thus bringing women to the post-menopausal period of their lives. Each phase brings new challenges. Vocal performance for classical singers in the stages of the perimenopause and the menopause is a subject matter that has barely been touched upon by researchers. As Fox DeMaio (2013) wrote in her thesis, "The Effect of Menopause on the Elite Singing Voice: Singing through the Storm",

Menopause and the attendant change in hormone levels mark a period of substantial change in the singing voice for many women. Little published information is available regarding these changes and the methods elite singers, and their teachers use to manage them. One reason for this lack of information may be a pervasive stigma attached to aging, particularly among women. Empirical research is needed to ascertain what successful coping strategies are used by elite singers in order to aid other singers as they negotiate menopause.
(p.13)

Symptoms can vary tremendously from woman to woman, and not all women suffer the same physical or physiological alterations. Some of the most common complaints from women are directly connected to the fluctuating hormones. As ovaries gradually cease to produce estrogen and progesterone, the two major hormones needed for women to maintain a healthy menstrual cycle, changes in the voice due to estrogen depletion pre and post menopause can include the following:

1. Reduction of skin thickness as collagen content decreases in the soft tissues
2. Changes in the mucous membrane that line the vocal tract
3. Loss of elasticity and collagenous fibers in the vocal folds
4. Decrease of the fundamental frequency of the voice

Subsequently, the adrenal glands take on the role of the ovaries producing small amounts of estrogen and progesterone, just enough to maintain female characteristics and overall health. As the hormones dwindle women can suffer hot flashes and night sweats, headaches, depression, low libido, brain fog and weight gain until the phase

beyond the actual menopause is reached where symptoms start to even out. The actual starting point of the menopause itself is very hard to identify. Doctors state that if a woman is without menstruation for a period of a year, then normally it is safe to assume that the woman has reached the menopause and thus enters her “post-menopausal” phase of life.

Mayo Clinic defines the menopause as: “The permanent cessation of menstrual periods, triggered by a natural decline in female hormones released by the ovaries. A woman has officially entered the menopause after she hasn’t had her menstrual period for 12 consecutive months” (Mayo Clinic, 2023).

Professional classical singers are no different from other women, nonetheless, may be more susceptible to symptoms, connected to the vocal cords and apparatus, than other women, who don’t use their voices professionally. Dryness of the throat and surrounding tissues, reduced flexibility, singing flat or “out of tune” without knowing why, reduced vocal range, normally affecting the higher vocal register and general weakness of vocal production, felt especially in the middle to lower range. “The most frequent voice-related complaints among postmenopausal women are dryness of the throat, frequent throat clearing, lower frequency levels of the voice, and voice sound alterations with increased roughness and hoarseness, as well as edema in the vocal folds” (Fox DeMaio, 2013, p.6).

Chapter 1: Objectives and Intentions

Having already briefly touched on the various phases of the menopause and what this entails for the female singer, with regards to general physical alterations and more specific alterations which may affect the voice, the question of what kind of exercises or techniques that could be beneficial at this time, remains. Scientifically backed solutions seem hard to find, and in this thesis the objective is precisely to do just that. If we examine readily available material on YouTube for example, some vocal coaches give instruction for singers during this phase but offer very little, or no explanation with regards to what exactly each individual exercise does and where it originated from, let alone the scientific backing or explanation to why or how it is beneficial to the voice.

In this thesis, I shall attempt to research and present viable and adequate suggestions of vocal exercises and that may help professional, female singers cope with any vocal problems they are experiencing, and that may serve as a valuable contribution to their present vocal regimen.

Chapter 2: Literature Review

Prior to the 1940's the only research that really existed in relation to hormones and the human voice concerned male voices. Research surrounding the menopause and the female voice gained momentum in the early 1990's with a surge of studies and articles.

In the 1996 article by Monique J Boulet and Björn J. Oddens, "Female Voice Changes around and after the Menopause" – an initial investigation, published in the *Journal of the Climacteric & Post menopause*, Boulet and Oddens analyze the views of 48 females and 24 male professional singers with regards to vocal changes in and around the fifth decade of life. The study's aim was to determine whether the differences felt by the women could be attributed to the menopause, and what impact it potentially could have. Although some symptoms were shared by all the participants, for example, the loss of the higher notes and changes in timbre, in general "women were more affected than men around the fifth decade. Voice emission, voice control and attainment of the highest registers seemed to occur more frequently in women than in men".

Their investigation highlighted, albeit, in a preliminary manner, concluded "that females suffer more vocal alterations than men in and around the fifth decade, and that these problems could be in fact related to declining estrogen levels". As an initial study, the authors managed to obtain pertinent information that could open the way for more in-depth research, so needed in the field.

Other important authors in the field would be J. Abitbol, P. Abitbol and B. Abitbol with "Sex Hormones and the Female Voice", (1996), and "The Voice and the Menopause: The Twilight of the Divas", (1998). In a study of 100 menopausal women, 17 presented with a "menopausal vocal syndrome." Abitbol, J. Abitbol, P. & Abitbol, B. (1996) "The menopausal vocal syndrome is characterized by lowered vocal intensity, vocal fatigue, a decreased range with loss of the high tones and a loss of vocal quality."

In 1995, Sabol, Lee & Stemple, under the Institute for Voice Analysis and Rehabilitation, published the article, "The Value of Vocal Function Exercises in the Practice Regimen of Singers". Dr. Joseph Stemple, a pioneer in voice disorders and voice therapy, developed a set of vocal exercises known as Vocal Function Exercises (VFE), to strengthen and increase coordination of vocal muscles. The study, composing of healthy, graduate-level singers, revealed positive results in the group of students who

had incorporated the exercises into their singing practice regimens, concluding that the study “served as a starting point for singing research directed at the analysis of specific vocal exercises that will help the singer to maintain optimum vocal efficiency”. These exercises, amongst other uses, are indicated for therapy for age related voice changes. VFE are composed of three types of exercise, that can effectively “strengthen and balance the laryngeal musculature, increase or improve vocal fold adduction and coordinate the subsystems of voice production” (Stemple 2020).

In 1997, Robert Sataloff, Deborah Caputo Rosen, Mary Hawkshaw and Joseph R. Spiegel publish an article in the *Journal of the Voice*, Vol. 11, n° 2 pp. 156-160 called “The Aging Adult Voice” in which the effects of general aging are analyzed and discussed. The aspects of general aging and the effect on the voice are the major themes under debate, however the changes associated to menopause are rather downplayed. A suggestion of hormone replacement treatment is referred to as a band aid to these problems.

“Certain aspects of the ageing process are relatively easy to control medically. For example, as female singers reach menopause, estrogen deprivation causes substantial changes in the mucous membranes that line the vocal tract, as well as changes in the muscles, and other areas throughout the patient’s body. These and other hormonal effects are frequently reflected in the voice but can be forestalled for many years with estrogen replacement therapy”.

The authors go on to state that: “however, treating physicians must be aware of contradictions to hormone replacement, especially if there is a history of other health problems such as breast cancer.”

Some women, whether singers or not, opt for Hormone Replacement Treatment (HRT), but for others, due to underlying health problems, this is not an option. Plus, there are singers who consider a more “holistic” approach to their problems the answer.

In Daniel Boone’s article, “The singing/Acting Voice in the Mature Adult, also published in the *Journal of the Voice*, vol. 11, N° 2, pp. 161 to 164, 1997, the author refers to studies into older professional voice users and how by maintaining a healthy vocal regime, general effects of aging can be substantially delayed. “With years of training and performance, the mature vocal performer experiences fewer vocal changes with aging than does his or her peer who is not a performer.”

However, here too the reference to hormonal changes is remedied by HRT: “The older professional female performer should be offered hormone replacement at the time of menopause.”

Joseph C. Stemple, author of the VFE voice therapy exercises, discussed later in more depth in this thesis, wrote in his article “A Holistic Approach to Voice Therapy”, University of Kentucky, 2005, veers towards, as the title suggests, holistic health regarding the voice, rather than one type of therapy. “The goal is to achieve maximum well-being, where everything functions to the very best level possible. From the holistic health perspective, voice is one part of the physical, emotional and life-style status of the individual.”

VFE are suggested as a “management approach”, well adapted to the concept of the more “holistic approach to voice therapy”, a radical change of opinion from authors of the earlier literature who seemed quite happy to slap a band-aid on any hormonal problem, in the form of HRT!

Ingo Titze, renown specialist in SOVT, (Semi-occluded Vocal Tract), therapy and exercises wrote an article in 2006. Published by the Journal of Speech, language and Hearing research, The American Speech-Language-Hearing Association, Titze conducted a study with regards SOVT therapy, arriving at the conclusion that economy-orientated voice training, SOVT exercises, are in fact beneficial for the voice, saying: “They can increase vocal intensity, efficiency and economy.”

Vocalization through a thin straw puts the vocal cords in the most optimum position and shape for vibration. The supraglottic pressure must partially negate the subglottic pressure from below thus creating a better position for phonation. With practice a strong, clear voice can be obtained that can withstand phonation for long periods of time, avoiding fatigue and hoarseness.

“Demonstrable Effect of Vocal Changes on Singing Voices of Post-Menopausal women”, a senior honors project by Haley L. Griffith, JMU Scholarly Commons, James Madison University, (2020) studies the effects of a structured vocal plan comprising of respiratory, resonance and phonatory exercises. Five participants between the ages of 45 and 63 took part in a controlled experiment where they had to complete four vocal exercises twice a day. Although the exercises that were implemented are well known in vocal teaching, no scientific base was offered to confirm the viability of the same.

Nancy Bos, Joanne Bozeman and Cate Frazier-Neely, authors of the recent book “Singing through the Change – Women’s voices in Midlife, Menopause and Beyond,” (2020), gathered testimonies of many female singers going through the menopause and beyond giving us insight into some of the difficulties singers face. A compassionate account, that provides us with a greater understanding of how the menopause and its inherent problems can impact singers’ lives.

In 2023, Mauro B Fiuza, Maria Luisa Sevillano and Filipa Lã published an article entitled “Singing at Menopause: A Systematic review with pedagogical implications”, *Musicae Scientiae* 2023, Vol.27 (1) pp. 193-217, which assembles perhaps the most fully comprehensive list of literature regarding the singing voice and the menopause ever compiled. Of the literature that met the criteria of the study, only six had relevant recommendations for vocal practice and performance geared towards helping menopausal singers combat possible vocal difficulties, once again reiterating that fact that so little information truly exists on the subject matter: Recommendations for vocal practice and performance to help singers cope with menopause related changes were made in one master’s thesis (Allen, 2006), three doctoral dissertations (Fox DeMaio, 2013; Price, 2010; Richie, 2013), and two articles (Price, 2013; Ouyong, 2018).

The common train of thought that prevailed throughout this literature is that a regular practice regimen is of utmost importance throughout the entirety of the singer’s career. “The singers, teachers of singing, and voice health specialists who were interviewed were unanimous in the view that a singing routine is important for maintaining a functional voice before, throughout, and after menopause.”

To achieve a healthy and stable voice, Price (2010) recommends the use of SOVT exercises. Fox DeMaio, (2013), also advocates the use of straw exercises, as well as humming. Allen (2006), states how otolaryngologists that he interviewed all expressed the importance of J. Stemple’s VFE, to nurture a correct vocal function and a healthy voice.

2.1: Phases of the Female Hormonal Cycle

2.1.1: Before Menopause – Menstruation

From the onset of a young woman's menstrual cycle, perhaps from the age of 11 or 12, until the beginning of the perimenopause, a woman can expect, if her health permits, to menstruate every month. This can mean that, other than periods of pregnancy and breast feeding, (menstruation will not resume whilst a baby is feeding regularly), a woman will go through the same hormonal pattern every month for at least 25 to 30 years.

For a professional singer negotiating the ups and downs of the hormonal cycle, it can be a challenge. Each phase of the menstrual cycle can give rise to alterations in the quality of vocal tone, flexibility and vocal range. The subject matter of this thesis is not to discuss the effects of menstruation on the voice, but rather to understand what happens when this well-rehearsed cycle begins to fail, thus breaking an established pattern. Therefore, a brief explanation of the hormonal cycle is required and justified.

To start with, the cycle itself lasts for an average of 28 days, for some women a little less, and others a little more. Irregularities in the cycle, that are not considered normal, can be caused by illness, excessive weight loss and stress, for example. Estrogen, one of the main characters in the storyline (a sex hormone produced by the ovaries), makes its appearance in the first half of the cycle, its job being to create a thick lining in the uterus, (the endometrium), where, if a fertilized egg arrives, it will embed itself in this lining and grow. Levels of estrogen reach their peak at mid cycle, just as ovulation occurs. After ovulation, progesterone, the other main character in the cycle, (produced by the corpus luteum, the empty follicle from which the egg came), is released. Progesterone, (in the case of pregnancy), ensures that the uterus lining maintains itself thick and healthy, thus sustaining the pregnancy. If it does not occur, however, the lining must be shed, and menstruation starts. Other sex hormones are involved in this delicate and intricate task, but the main players are estrogen and progesterone.

High levels of estrogen in the first half of the cycle can cause potential side effects in some women, but generally this phase of the cycle is when women feel their best, and it is when the voice is at its best too. The cords are flexible, and the mucous membranes have more than adequate lubrication. Singing seems easy and full vocal range effortless. After ovulation, the luteal phase begins. Progesterone comes into action to

ensure implantation of the egg. If no egg appears, progesterone levels start to plummet and with the lack of both estrogen and progesterone, eventually the lining is shed. Bloating, headaches, tiredness, irritability are but some of the possible general symptoms. Menstruation begins and the whole cycle starts over. Women deal with this cycle for years, entertaining physical and psychological changes, that effect their daily lives. Professional singers too must deal with these general changes as well as the changes that may have a notary effect on the quality of the voice and their vocal performance. However, as this cycle repeats itself time and again for many years, the singer surely acquires all the necessary self-awareness to cope with these hormonal shifts.

2.1.2: Perimenopause

Perimenopause is the phase that precedes the actual menopause. Perimenopause can last for as long as 10 years, (or even longer), prior to reaching cessation of menstruation. “The hormone driven transformation of the voice from perimenopause to post menopause takes place over time – up to 10 to 15 years – happening for most between the ages of 40 to 60.”, (Boz, Bozman & Neely, 2020, Chapter 2, p. 20).

Voice changes gradually creep up the unsuspecting singer, who at first perhaps ignores such signs. But as “adaptation techniques and maneuvers” increase, vocal discomfort and difficulties in vocal production persist:

“Voice changes usually start as barely noticeable physical changes in sound that seem to come and go. Some of the most common issues are dry throat and mouth, decreased volume, reduced flexibility and changes in pitch range. Sometimes we unconsciously try to overcome these gradual changes with small muscular adjustments in order to compensate for what isn’t functioning well” (Boz et. al., 2020, Chapter 2, p. 21).

Adjustments that can lead to more difficulties, frustration and eventually vocal dysfunction.

2.1.3: Menopause

The menopause is the moment when the woman's body has no remaining eggs and her ovaries have decided they are going to pass control over to the adrenal glands, (a gland that sits over the kidneys which will go on to produce enough of the female sex hormones necessary to maintain female characteristics), and where all menstrual activity will cease and not resume. As previously stated above, to pinpoint the actual moment of the menopause itself is almost impossible. Women are defined as "in menopause" when they have not menstruated for a year and their blood work indicates the correct hormonal level.

Leslie went through perimenopause and the beginning of midlife with no noticeable voice upset. But singing was challenging for several years when her periods stopped at the age of 52. "My voice was unpredictable and unstable; it was terrifying. I wasn't sure what was going to come out of my mouth. I kept thinking, 'Everything in my body is the same as the day before, My posture, my breathing, my core feels the same; but the sound and singing sensations are unexplainably different day to day.'..." (Bos, N., Bozeman, J., & Frazier-Neely, C., 2020, p. 11).

2.1.4: Post Menopause

The post menopause is the phase that follows the actual moment of “menopause”. Estrogen and progesterone fall to their lowest levels and begin to stabilize. This can be a phase of great relief for women. Not only are they not bothered by the constant chore of monthly menstruation, but they are also free of the “fear” of having an unwanted pregnancy in later life. Singers may or may not suffer problems during this phase, and surprisingly it can for some, be a very enriching process leading to great satisfaction with the maturity of their voice.

Alejandra, a 60-year-old professional, classical singer from Mexico, said that as her hormones settled down, her voice improved. “It has gotten better with age; it has more body. My Pitch accuracy became better. There is a more interesting quality of the voice. I express more emotion in my singing. (Bos, N., Bozeman, J., & Frazier-Neely, C., 2020, p. 137).

Others, on the other hand, suffer greatly. “Dr. Jean Abitbol, a French laryngologist researched 100 female singers who were post menopause, and, identified voice changes including loss of range and vocal color, decreased agility and voice fatigue.” (Bos, N., Bozeman, J., & Frazier-Neely, C., 2020, p. 41).

2.2: Exercises and Techniques Possibly Adequate for the Menopausal Voice

2.2.1: Semi-occluded Vocal Tract Exercises

SOVT are a series of exercises that elongate the anterior vocal tract give way to a facilitated vocal vibratory characteristic and the activation of the laryngeal muscle group. In 2006, according to Titze, semi-occluded vocal tract configurations have the effect of matching the impedance to airflow exerted by the sound source, the glottis and sound filter, (the supraglottic regions), effectively boosting the sound intensity in an efficient and economical manner.

Lip trills, nasal humming, phonating through straws and tubes of different diameters in different depths of water are all techniques that can be considered forms of semi-occluded exercises. The introduction of a secondary vibratory source, for example lips and tongue trills, and the actual water that the air is blown through whilst using the straw, all contribute to better physiological and acoustic results.

SOVT exercises are used by vocal coaches to maintain vocal stability and a focused tone. Vocal warm-ups may include humming exercises, lip trills and phonating through a straw with or without the aid of a glass of water:

Experienced singers or speakers can further enhance their voice by doing a range of exercises during semi-occluded vocal tract training.: Some common SOVT exercises include:

Humming: humming/voicing on nasal consonants (M and N), lip or tongue trills, voiced fricatives (Z, V etc.), labio-lingual trills, or rounded lip vowels such as “O” or “U”.

Straw therapy using straws of different lengths and diameters. The student/patient blows gently through the straw into varying depths of water. The deeper the water, the more pressure exerted. Sounds, i.e., notes and scales can also be produced through the straw. (Matthews, J., 2021).

Many of these exercises are frequently used in vocal training or singing lessons, so whether needed for therapeutic purposes or otherwise, classically trained singers most probably have already had contact with this genre of vocal exercise in their regime at some point in their lives. The exercises have been shown to regulate air flow and to

enable the vocal cords to vibrate in a more efficient manner, making phonation and tone production easier and more focused. In the article “Voice Training and Therapy with a Semi-Occluded Vocal Tract: Rationale and Scientific Underpinnings” written by Ingo Titze and published in the Journal of Speech, Language and Hearing Research, 2006, Titze explains how this type of exercise has helped singers for a long time.

The vocal cords vibrate more efficiently with a lot less pressure which enables the singer to exercise the cords without putting excess stress and pressure on the voice. Simply stated, semi-occluded exercises change the way that the vocal folds vibrate. The vocal folds then vibrate in a more efficient, economic manner, which takes pressure off the instrument. Semi-occluded exercise is an excellent vocal regimen for the aging voice where the thickening of the epithelium can cause huskiness in the middle voice. (Fox DeMaio B., 2013, p.28).

Lessac-Madsen Resonant Voice Therapy (LMTVT) was developed by Dr. Katherine Verdolini Abbott. LMTVT is a kind of technique or therapy used to treat subjects that have problems with the adduction of the vocal cords. Dr. Verdolini Abbott is a professor of Communication Sciences and Disorders at the University of Delaware and specializes in voice and voice disorders. Perhaps due to her previous career in vocal performance and the problems she suffered herself, she is the author of much literature and articles all related to pathologies of the voice, her LMTVT exercises are considered very beneficial for guiding vocal fold posturing. The main purpose of the therapy is:

- “To have a strong, clear voice that can be heard over a distance and in background noise, as well as close up.
- To prevent future injury to the vocal folds and reverse injury where exists.” (Lispeech.com, 2024).

Exercises predominantly focus on teaching the individual to work yet again with the vibrations at the front of the mouth, emphasizing the importance of sensorial perception of the sound and the placing of the voice.

On closer inspection, the three types of vocal exercises written about above all share similarities: focusing on the warm-up or phonation process at the front of the buccal or nasal cavity, through humming or semi-occluded exercises to relieve the vocal cords of any excess pressure, friction or adduction. Whilst others even out breath flow, help to regulate vocal cord vibration and help with maintaining the general flexibility of the voice.

All of which are used and proven successful in speech therapy and are documented to work very well for singers.

2.2.2: Dr. Joseph C. Stemple VFE – Vocal Function Exercises

Dr. Joseph Stemple's Vocal Function Exercises (VFE) are a set of four simple and assessable exercises widely used in voice therapy. Consisting of four contrasting exercises, each one corresponding to a particular goal, that work together to rehabilitate and enhance vocal function. The exercises, as referred to by Stemple himself in his article "Holistic Approach to Voice Therapy" from *Seminars in Speech and Language*, June 2005, appear, to benefit individuals with a wide range of voice disorders and are equally effective in enhancing the normal voice. The exercises, derived from a series of "Laryngeal muscle exercises" by Betram Briess, "stive to balance the subsystems of voice production whether disorder is one of vocal hyperfunction or hypofunction.

Dr. Joseph Stemple, a "pioneer in voice disorders and voice therapy" showed in his study, composing of healthy, graduate-level singers, positive results in the group of students who had incorporated the exercises into their singing practice regimens, concluding that the study "served as a starting point for singing research directed at the analysis of specific vocal exercises that will help the singer to maintain optimum vocal efficiency". These exercises, amongst other uses, are indicated for therapy for age related voice changes. VFE are composed of three types of exercises, that can effectively, according to Stemple in 2020, strengthen and balance the laryngeal musculature, increase or improve vocal fold adduction and coordinate the subsystems of voice production. Consisting of phonation on the vowel "l" (which engages the vocal mechanism), slides, or "Whoops" from head register to chest and vice versa, which helps recuperate and maintain elasticity and flexibility of the cords, and finally prolonged vocalization on the vowel "o" which serves to regulate breath control, focus the tone with little or no pressure on the larynx. VFE exercises were developed to treat vocal disorders, through a relatively simple process that involves the "manipulation" of the physiological relationship between respiration, phonation, and resonance.

In the article "The Value of Vocal Function Exercises in the Practice Regimen of Singers", by Sabol, J.W., Lee, L., and Stemple, C, J., 20 female singers of graduate level took part in a study where they were subject to a specific vocal regimen made up of VFE's. The vocal regime, prescribed by Stemple consists of the following:

The first exercise consists of singing a sustained /i/ vowel of F, (Fá) above middle C, (Dó Central) for women and children, and an octave lower for adult males. Attention is given to abdominal breathing and support as well as a good frontal facial position for the resonance.

The second exercise, as described by Stemple, is a vocal glide sung from the lowest note to the highest on the word “knoll”, the objective being to concentrate on the “oll” sound. This encourages an “expanded open pharynx”, beneficial for easy, effortless voice production. This glide works all the laryngeal muscles and engages all the cricothyroid muscles.

The third exercise is the opposite of the last. Here the person in treatment is required to glide from their highest note to their lowest. The same vowel /i/ is used and the exercise is carried out at the same pitch, on the F (Fá) above middle C (Dó Central), for adult males. A semi yawn position is required so that “expanded open pharynx” facilitates vocal production.

The fourth exercise comprises of the patient singing and sustaining the word “knoll” on five consecutive notes for as long as possible, middle C to G for females and children, and once again, an octave lower for adult males. The “oll” is the objective, as is above.

All exercises are to be carried out as “piano” as possible, so to work the intricate subsystems of the voice, without the patient even realizing. Care is given to forward vibratory mechanisms, the glottal attack, breath control and voice breaks.

All exercises are to be repeated four times daily, two repetitions in the morning and two in the afternoon.

In Christopher Watt’s article “Voice treatment: Orientations, Framework and Interventions”, the exercises are classified as the warm up, stretch, contract and power. Basically, a complete vocal work-out in such and apparently simple group of exercises. Results of the study showed that generally all subjects showed significant improvement of vocal function: the primary physiological effects of the Vocal Function Exercises were reflected in altered phonation volumes, airflow rates, and maximum phonation times. The study goes on to conclude that: these exercises may serve as a model for similar exercises or as an additional exercise program to be added to the many pedagogical approaches (Watts, 2019).

Pedagogical approaches as well as therapeutic approaches, including treatment of vocal pathologies, symptoms of the aging voice as well as the menopausal voice. The gentle approach to the phonation improves adduction of the vocal cords without being too aggressive. Vocal cords of females that may be swollen due to hormonal fluctuations

can benefit tremendously from this type of exercise, avoiding forced adduction and excess subglottic pressure, which can cause hoarseness and aphonia if vocal abuse or compensatory tactics continue.

2.2.3: Messa di Voce

Since the Baroque Era, *Messa di Voce* is a training technique that had been used by professional singers and their coaches to obtain optimal control over the increase and decrease of tone intensity, on one single note, produced with just one breath. *Messa di Voce*, literally translated as “the placing of the voice” gained notoriety during the 19th and 20th centuries, establishing itself as part of technique of “Bel Canto”. In Diane M Pulte’s doctorate proposal “*The Messa di Voce and its Effectiveness as a Training Exercise for the Young Singer*”, The Ohio State University, 2005, the author, although proposing a study which encompasses young singers, explains in depth the fundamental structure and process of the exercise along with all the possible benefits.

Originating in Florence, Italy, the Florentine Camarata, a society of musicians and poets, adopted the term *Messa di Voce* to represent a new art of singing that would bring increased expressivity to music (Pulte, 2005, p.7). Through their persistent intentions, what originally was sort after to provide dynamic color and depth, turned into practical exercises that needed to be practiced.

According to Pulte, a large number of muscles are used to execute the MDV, Titze 31, (*Messa di Voce*). All the minute changes that must rapidly come about reports to be a difficult task to master, especially if falling around the “*passagio*”, or the change of register.

The diaphragm, the external and internal intercostal muscles, and all the abdominal muscles are all involved with the movement of inspiration and expiration. The cricoarytenoid muscles of the larynx, the lateral and the posterior, that manage the opening and closing of the vocal cords, along with the thyroarytenoid muscles, those of the cords themselves, all must learn to increase or release tension, according to what is required, be it a crescendo or a diminuendo. Pulte goes on to cite: Titze (Ingo), has asserted that this exercise may in fact be the most important one for the singer to master when building a flexible and responsive vocal technique. (Titze 31, *More on Messa di Voce*).

On the Petersen Voice Studio website, in his article “*Mancini and the Messa di Voce*”, Ingo Titze is cited once again, listing the benefits, in his opinion of the *Messa di Voce*:

- “Engages the layers of the vocal fold tissue gradually in vibration, medial to lateral;
- Helps singers match tension in muscle to tension ligament;
- Tests symmetry of *crescendo* versus *decrescendo* control under continually decreasing lung volume;
- Makes all intrinsic muscles of the larynx work in coordination with changing lung pressure.”- Titze, Ingo R. “The Five Best Vocal Warm-up Exercises”. *Journal of Singing* 57.3 (2001): pp. 51-52.

Justin Petersen, the author of the article, interestingly states that:

Another point I'd like to make regarding the *Messa di Voce*, (Which I don't have the firm science for but intuited from my understanding of vocal function), is the muscular mirroring of the *Messa di Voce* that is found in the glissando slides.

What I mean by that is: as one glides from the bottom of the voice to the top, the voice moves from the bulkier muscle, (thyroarytenoid action, TAs to a more ligamentous action (through the crico-thyroids, CTs). When one descends the scale, the action is reversed. The exact muscular behavior is the opposite of what occurs in the *Messa di Voce*, whereby the vocal folds are more dominated by the action of the CTs in the quiet portion of the exercise, and as the tone becomes louder, greater activity of the TA engages through increased vertical phase difference. A glide up and down would mirror *forte-piano-forte* fold behavior. A glide from the top down and back would replicate the *piano-forte-piano* behavior found in *Messa di Voce*. When the tone becomes quieter, this indicates the TA behavior has lessened and returned to a thinner, more CT dominant fold. Therefore, my non-scientific opinion is that the *Messa di Voce* on a single note is the muscular equivalent of sliding from the top to the bottom of the voice, and back up again.

From the authors perspective, and consequently, from my very own “non-scientific” opinion, the Vocal Slide from the highest resonance to the lowest that has already been discussed in Joseph Stemple's VFE works the muscles in the same manner as a *Messa di Voce* exercise. Exercises that are indicated for the aging voice, as referred to above. Taking this into consideration, one could say that this is a strong indication that *Messa di Voce* exercises are greatly beneficial for the female professional singer during all her singing career, and even more optimal from the onset of menopause. Proper instruction and gradual training are required to obtain the best

results as these are not an exercise for beginners. Adequate breathing and support may not be sufficiently developed by younger singers to sustain many exercises of this nature. However, if a professional singer did incorporate *Messa di Voce* exercises in her regimen, surely this would stand her in good stead for the later years of her career.

Chapter 3: Methodology

In August of 2024 a questionnaire (Google Survey), and a link to recordings were sent via e-mail to 10 voice specialists - three voice teachers, three female professional singers and four voice therapists. Through the recorded exercises I attempted to ascertain:

- Whether the interviewees knew or recognized them
- Whether they utilized them in their daily routines or work
- Whether they associated them with the menopausal voice

The institutions that I approached were selected for their reputability and renowned success in their area of expertise. The chosen establishments are as follows: The Universidade do Algarve, The Conservatório de Música de Braga, The Instituto do Politécnico do Porto and The Coro do Teatro do São Carlos. The recorded exercises were compiled and recorded by myself to exemplify my proposal for the rehabilitation and retraining of professional singers during the phases of the perimenopause, menopause and post-menopause. This chapter presents a compilation of the surveys' content, the responses and analysis of the same.

3.1 Questionário para Cantoras Profissionais

Questionnaire for Professional Female Singers

Este questionário está a ser desenvolvido no âmbito do trabalho final do Mestrado em Música / Interpretação, da Universidade de Évora. Tem como objetivo conhecer a sua perspetiva profissional acerca dos exercícios vocais associados à tese em baixo referida. Este questionário serve para registar a sua opinião. Não existem respostas certas nem erradas. Deve ler atentamente cada questão e responder o mais honestamente possível. Na recolha de dados e na apresentação dos resultados obtidos será mantido o anonimato de todos os participantes.

This survey is being carried out for my master's thesis in Music / Performance at the University of Évora. The objective is to find out your professional perspective on vocal exercises that relate to the thesis which is referred to below. The survey is to register your opinion. There are no right or wrong answers. Please read each question slowly and answer as honestly as possible. The collection and presentation of all data will preserve the anonymity of all participants.

A minha tese é intitulada “Exercícios Vocais e Técnicas específicas para cantoras profissionais durante a fase da Menopausa”.

Após muita pesquisa e análise, selecionei alguns exercícios que acredito que irão ajudar cantoras profissionais durante esta fase tão delicada da Perimenopausa, a Menopausa e a pós-Menopausa. Fiz gravações de exemplos destes exercícios aos quais podem ter acesso no seguinte link: https://youtu.be/UO81VXAwA_c. Envio também um breve inquérito, que gostaria que respondesse depois de ter apreciado os exercícios gravados.

A transição para a Menopausa é talvez uma das fases menos desejadas na vida de uma mulher, especialmente no mundo ocidental. Ao longo da passagem dos trinta para os quarenta anos de idade, a consciência de que a Menopausa é uma realidade começa a surgir constantemente como algo de inevitável. Perimenopausa, a fase inicial poderá durar até 10 anos, e é seguida da Menopausa em si, que define o completo cessar da menstruação, seguindo-se inevitavelmente o período de pós-Menopausa das suas vidas.

Cada fase da Menopausa traz desafios novos. A Menopausa não é considerada por muitos um período positivo, com artigos definindo um quadro muito pouco favorável de pouca libido, afrontamentos, aumento de peso e depressão. Desta forma, muito antes das cantoras o esperarem, afeta a sua voz. Rouquidão, garganta seca, perda do registo agudo ou grave, flexibilidade e agilidade reduzida com a oscilação das hormonas, são apenas alguns dos efeitos secundários que as mulheres podem sofrer. As cantoras profissionais, professores da área ou alunas de canto, necessitam cada vez mais de ter um conhecimento profundo desta situação, pois afeta mais cedo ou mais tarde as suas vidas artísticas e profissionais. O treino, orientação e suporte, devem ser constantes ao longo do seu percurso vocal. A Menopausa não tem de ser um motivo maior para um afastamento tão precoce de palcos ou aulas. É necessária uma abordagem mais estruturada e realizável, de forma que a cantora possa entender que técnica ou técnicas vocais pode utilizar, e assim, através de um treino adaptativo às suas necessidades, possa maximizar o seu trabalho e obter melhores resultados.

My thesis is entitled, "Vocal Exercises and Specific Techniques for Professional Singers During the Period of the Menopause".

After much research and appreciation, I have assembled several exercises that I believe could help female professional singers during this delicate time of the perimenopause, the menopause and the post menopause. I have made recordings of these exercises that you can access here https://youtu.be/UO81VXAwa_c, and I am also sending you a brief questionnaire, that, if possible, I would like you to answer after watching the recorded exercises.

The menopausal transition is perhaps one of the less desired phases in a woman's life, especially in the Western world. As women sail through their thirties and on into their fourth decade, the notion that menopause is inevitable slowly begins to become apparent. Perimenopause, an initial phase can last up to 10 years, is followed by a complete cessation of menstruation, the menopause, thus bringing women to the post-menopausal period of their lives. Each phase brings new challenges. Menopause does not receive much good press, with endless articles on-line and in magazines normally veering towards a grim picture of low libido, hot flashes, weight gain and depression, well before the unsuspecting singer has even considered that it may, too, affect her voice. Hoarseness, throat dryness, loss of either the higher or lower ends of the vocal register, reduced flexibility and agility as hormones wax and wane, are but a few of the physical alterations' women may suffer. Professional singers, teachers and students alike need a deeper awareness of the problem. Training, guidance and support

should be available. The menopause itself should not be the soul motive for early retirement from the stage. A structured and easy approach is needed, so that the singer can understand what vocal techniques and/or adaptive training would be good for her, how it works, and what results can be obtained.

Secção 1 / *Section 1*

1. Idade / *Age*

2. Está na fase da: / *Are you in your:*

- i. Perimenopausa / *Perimenopause*
- ii. Menopausa / *Menopause*
- iii. Após Menopausa / *Post Menopause*
- iv. Outro / *Other*

3. Desde quando é que está nesta fase? / *Since when are you in this phase?*

- i. 1 a 3 anos / *1 to 3 years*
- ii. 3 a 5 anos / *3 to 5 years*
- iii. Mais do que 5 anos / *More than 5 years*
- iv. Outro / *Other*

4. Quais os sintomas que sente ou sentiu em termos gerais?

What symptoms did you feel/or are feeling in general terms?

- i. Afontamentos / *Hot flashes*
- ii. Dores de Cabeça / *Headaches*
- iii. Desorientação mental / *Brain fog*
- iv. Dores nas articulações / *Joint pain*
- v. Depressão / *Depression*
- vi. Outro / *Other*

Por favor, descreva em baixo: / *Please describe below:*

5. Sente ou sentiu diferenças na sua produção vocal? / *Did you feel or are you feeling any differences in your vocal production?*

- i. Fadiga / *Fatigue*
- ii. Rouquidão / *Hoarseness*
- iii. Extensão vocal reduzida / *Reduced vocal range*
- iv. Flexibilidade vocal reduzida / *Reduced vocal flexibility*
- v. Outro / *Other*

Por favor, descreva em baixo: / *Please describe below:*

Secção 2 / Section 2

Após ter ouvido e visto as gravações dos exercícios vocais por favor responda ao seguinte: / *After watching and listening to the recordings please answer the following:*

2.1. Usa estes exercícios no seu regime vocal? / *Do you use these exercises in your vocal regimen?*

Exercício 1 Joseph Stemple – “i”

Exercise 1 Joseph Stemple – “i”

Sim / Yes

Não / No

Exercício 2 de Joseph Stemple – Siren em “Knoll” da ressonância mais grave para a ressonância mais aguda.

Exercise 2 Joseph Stemple – Vocal Slide on “Knoll” from lowest to highest resonance.

Sim / Yes

Não / No

Exercício 3 de Joseph Stemple – Siren em “Knoll” da ressonância mais aguda para a ressonância mais grave.

Exercise 3 Joseph Stemple – Vocal Slide on “Knoll” from the highest resonance to the lowest.

Sim / Yes

Não / No

Exercício 4 de Joseph Stemple – “Knoll” numa nota sustentada de Dó Central para sol ascendente e descendente.

Exercise 4 Joseph Stemple – “Knoll” on sustained note from Middle C to G ascending and descending.

Sim / Yes

Não / No

Exercício 5 Trato Vocal Semí-ocluso – Soprar através de uma palhinha para dentro de água.

Exercises 5 Semi-occluded Vocal Tract – Blowing Through a Straw into Water.

Sim / Yes

Não / No

Exercício 6 Trato Vocal Semí-ocluso – Trilo de Lábios

Exercises 6 SOVT – Lip Trill

Sim / Yes

Não / No

Exercício 7 – Messa di Voce - piano para forte para piano numa nota sustentada.

Exercise 7 – Messa di Voce – piano to forte to piano on one sustained note.

Sim / Yes

Não / No

2.2 Pensa que estes exercícios são úteis para cantoras profissionais durante a fase da Menopausa? / *Do you think that these exercises are useful for female professional singers during the phases of the Menopause?*

i. Sim / Yes

ii. Não / No

2.3 Conhece outros exercícios vocais que podem ser benéficos durante a fase da Menopausa? / *Do you know of any other vocal exercises that may be beneficial during the phases of the Menopausa, and if so, Why?*

Por favor, comente: / *Please comment:*

3.2 Questionário para Terapeutas da Voz

Questionnaire for Voice Therapists

Este questionário está a ser desenvolvido no âmbito do trabalho final do Mestrado em Música / Interpretação, da Universidade de Évora. Tem como objetivo conhecer a sua perspetiva profissional acerca dos exercícios vocais associados à tese em baixo referida. Este questionário serve para registar a sua opinião. Não existem respostas certas nem erradas. Deve ler atentamente cada questão e responder o mais honestamente possível. Na recolha de dados e na apresentação dos resultados obtidos será mantido o anonimato de todos os participantes.

This survey is being carried out for my master's thesis in Music / Performance at the University of Évora. The objective is to find out your professional perspective on vocal exercises that relate to the thesis which is referred to below. The survey is to register your opinion. There are no right or wrong answers. Please read each question slowly and answer as honestly as possible. The collection and presentation of all data will preserve the anonymity of all participants.

A minha tese é intitulada “Exercícios Vocais e Técnicas específicas para cantoras profissionais durante a fase da Menopausa”.

Após muita pesquisa e análise, selecionei alguns exercícios que acredito que irão ajudar cantoras profissionais durante esta fase tão delicada da Perimenopausa, a Menopausa e a pós-Menopausa. Fiz gravações de exemplos destes exercícios aos quais podem ter acesso no seguinte link: https://youtu.be/UO81VXAwA_c. Envio também um breve inquérito, que gostaria que respondesse depois de ter apreciado os exercícios gravados.

A transição para a Menopausa é talvez uma das fases menos desejadas na vida de uma mulher, especialmente no mundo ocidental. Ao longo da passagem dos trinta para os quarenta anos de idade, a consciência de que a Menopausa é uma realidade começa a surgir constantemente como algo de inevitável. Perimenopausa, a fase inicial poderá durar até 10 anos, e é seguida da Menopausa em si, que define o completo cessar da menstruação, seguindo-se inevitavelmente o período de pós-Menopausa das suas vidas. Cada fase da Menopausa traz desafios novos. A Menopausa não é considerada por muitos um período positivo, com artigos definindo um quadro muito pouco favorável de pouca libido, afrontamentos, aumento de peso e depressão. Desta

forma, muito antes das cantoras o esperarem, afeta a sua voz. Rouquidão, garganta seca, perda do registo agudo ou grave, flexibilidade e agilidade reduzida com a oscilação das hormonas, são apenas alguns dos efeitos secundários que as mulheres podem sofrer. As cantoras profissionais, professores da área ou alunas de canto, necessitam cada vez mais de ter um conhecimento profundo desta situação, pois afeta mais cedo ou mais tarde as suas vidas artísticas e profissionais. O treino, orientação e suporte, devem ser constantes ao longo do seu percurso vocal. A Menopausa não tem de ser um motivo maior para um afastamento tão precoce de palcos ou aulas. É necessária uma abordagem mais estruturada e realizável, de forma que a cantora possa entender que técnica ou técnicas vocais pode utilizar, e assim, através de um treino adaptativo às suas necessidades, possa maximizar o seu trabalho e obter melhores resultados.

My thesis is entitled, “Vocal Exercises and Specific Techniques for Professional Singers During the Period of the Menopause”.

After much research and appreciation, I have assembled several exercises that I believe could help female professional singers during this delicate time of the perimenopause, the menopause and the post menopause. I have made recordings of these exercises that you can access here https://youtu.be/UO81VXAwa_c, and I am also sending you a brief questionnaire, that, if possible, I would like you to answer after watching the recorded exercises.

The menopausal transition is perhaps one of the less desired phases in a woman’s life, especially in the Western world. As women sail through their thirties and on into their fourth decade, the notion that menopause is inevitable slowly begins to become apparent. Perimenopause, an initial phase can last up to 10 years, is followed by a complete cessation of menstruation, the menopause, thus bringing women to the post-menopausal period of their lives. Each phase brings new challenges. Menopause does not receive much good press, with endless articles on-line and in magazines normally veering towards a grim picture of low libido, hot flashes, weight gain and depression, well before the unsuspecting singer has even considered that it may, too, affect her voice. Hoarseness, throat dryness, loss of either the higher or lower ends of the vocal register, reduced flexibility and agility as hormones wax and wane, are but a few of the physical alterations’ women may suffer. Professional singers, teachers and students alike need a deeper awareness of the problem. Training, guidance and support should be available. The menopause itself should not be the soul motive for early retirement from the stage. A structured and easy approach is needed, so that the singer

can understand what vocal techniques and /or adaptive training would be good for her, how it works, and what results can be obtained.

Secção 1 / Section 1

1. Ocupação / Occupation

2. É profissional de saúde que lida com problemas relacionada com a voz?

Are you a medical professional that deals with problems related to the voice?

3. Trata ou já tratou cantoras profissionais com problemas relacionadas com a menopausa? Sim / Não. Por favor, comente:

Do you, or have you treated any female professional singers with menopause related problems regarding their voice? Yes / No. Please comment:

Secção 2 / Section 2

Após ter ouvido e visto as gravações dos exercícios vocais por favor responda às perguntas seguintes:

After listening and watching the recordings of the vocal exercises please answer the following:

2.1 Conhece estes exercícios?

2.1 Do you know any of these exercises?

Exercício 1 Joseph Stemple – “i”

Exercise 1 Joseph Stemple – “i”

Sim / Yes

Não / No

Exercício 2 de Joseph Stemple – Siren em “Knoll” da ressonância mais grave para a ressonância mais aguda.

Exercise 2 Joseph Stemple – Vocal Slide on “Knoll” from lowest to highest resonance.

Sim / Yes

Não / No

Exercício 3 de Joseph Stemple – Siren em “Knoll” da ressonância mais aguda para a ressonância mais grave.

Exercise 3 Joseph Stemple – Vocal Slide on “Knoll” from the highest resonance to the lowest.

Sim / Yes

Não / No

Exercício 4 de Joseph Stemple – “Knoll” numa nota sustentada de Dó Central para sol ascendente e descendente.

Exercise 4 Joseph Stemple – “Knoll” on sustained note from Middle C to G ascending and descending.

Sim / Yes

Não / No

Exercício 5 Trato Vocal Semí-ocluso – Soprar através de uma palhinha para dentro de água.

Exercises 5 Semi-occluded Vocal Tract – Blowing Through a Straw into Water.

Sim / Yes

Não / No

Exercício 6 Trato Vocal Semí-ocluso – Trilo de Lábios

Exercises 6 SOVT – Lip Trill

Sim / Yes

Não / No

Exercício 7 – *Messa di Voce* - piano para forte para piano numa nota sustentada.

Exercise 7 – Messa di Voce – piano to forte to piano on one sustained note.

Sim / Yes

Não / No

2.2 Utiliza alguns destes exercícios com os seus pacientes? Por favor, comente:

2.2 Do you know any of these exercises with your patients? Please comment:

Secção 3/ Section 3

Recomendações de Terapeutas da Voz

Recommendations by Voice Therapists

Existem outros exercícios que podia recomendar para cantoras profissionais a sofrerem de alterações vocais durante as fases da menopausa? Por favor, comente:

What other exercises can you recommend for female professional singers suffering from vocal alterations during the phases of the menopause? Please comment:

3.3 Questionário para Professores de Canto

Questionnaire for Voice Teachers

Este questionário está a ser desenvolvido no âmbito do trabalho final do Mestrado em Música / Interpretação, da Universidade de Évora. Tem como objetivo conhecer a sua perspetiva profissional acerca dos exercícios vocais associados à tese em baixo referida. Este questionário serve para registar a sua opinião. Não existem respostas certas nem erradas. Deve ler atentamente cada questão e responder o mais honestamente possível. Na recolha de dados e na apresentação dos resultados obtidos será mantido o anonimato de todos os participantes.

A minha tese é intitulada “Exercícios Vocais e Técnicas específicas para cantoras profissionais durante a fase da Menopausa”.

Após muita pesquisa e análise, selecionei alguns exercícios que acredito que irão ajudar cantoras profissionais durante esta fase tão delicada da Perimenopausa, a Menopausa e a pós-Menopausa. Fiz gravações de exemplos destes exercícios aos quais podem ter acesso no seguinte link: https://youtu.be/UO81VXAwA_c. Envio também um breve inquérito, que gostaria que respondesse depois de ter apreciado os exercícios gravados.

A transição para a Menopausa é talvez uma das fases menos desejadas na vida de uma mulher, especialmente no mundo ocidental. Ao longo da passagem dos trinta para os quarenta anos de idade, a consciência de que a Menopausa é uma realidade começa a surgir constantemente como algo de inevitável. Perimenopausa, a fase inicial poderá durar até 10 anos, e é seguida da Menopausa em si, que define o completo cessar da menstruação, seguindo-se inevitavelmente o período de pós-Menopausa das suas vidas.

Cada fase da Menopausa traz desafios novos. A Menopausa não é considerada por muitos um período positivo, com artigos definindo um quadro muito pouco favorável de pouca libido, afrontamentos, aumento de peso e depressão. Desta forma, muito antes das cantoras o esperarem, afeta a sua voz. Rouquidão, garganta seca, perda do registo agudo ou grave, flexibilidade e agilidade reduzida com a oscilação das hormonas, são apenas alguns dos efeitos secundários que as mulheres podem sofrer. As cantoras profissionais, professores da área ou alunas de canto, necessitam cada vez mais de ter um conhecimento profundo desta situação, pois afeta mais cedo ou mais

tarde as suas vidas artísticas e profissionais. O treino, orientação e suporte, devem ser constantes ao longo do seu percurso vocal. A Menopausa não tem de ser um motivo maior para um afastamento tão precoce de palcos ou aulas. É necessária uma abordagem mais estruturada e realizável, de forma que a cantora possa entender que técnica ou técnicas vocais pode utilizar, e assim, através de um treino adaptativo às suas necessidades, possa maximizar o seu trabalho e obter melhores resultados.

This survey is being carried out for my master's thesis in Music / Performance at the University of Évora. The objective is to find out your professional perspective on vocal exercises that relate to the thesis which is referred to below. The survey is to register your opinion. There are no right or wrong answers. Please read each question slowly and answer as honestly as possible. The collection and presentation of all data will preserve the anonymity of all participants.

My thesis is entitled, "Vocal Exercises and Specific Techniques for Professional Singers During the Period of the Menopause".

After much research and appreciation, I have assembled several exercises that I believe could help female professional singers during this delicate time of the perimenopause, the menopause and the post menopause. I have made recordings of these exercises that you can access here https://youtu.be/UO81VXAwA_c, and I am also sending you a brief questionnaire, that, if possible, I would like you to answer after watching the recorded exercises.

The menopausal transition is perhaps one of the less desired phases in a woman's life, especially in the Western world. As women sail through their thirties and on into their fourth decade, the notion that menopause is inevitable slowly begins to become apparent. Perimenopause, an initial phase can last up to 10 years, is followed by a complete cessation of menstruation, the menopause, thus bringing women to the post-menopausal period of their lives.

Each phase brings new challenges. Menopause does not receive much good press, with endless articles on-line and in magazines normally veering towards a grim picture of low libido, hot flashes, weight gain and depression, well before the unsuspecting singer has even considered that it may, too, affect her voice. Hoarseness, throat dryness, loss of either the higher or lower ends of the vocal register, reduced flexibility and agility as hormones wax and wane, are but a few of the physical alterations' women may suffer. Professional singers, teachers and students alike need a deeper

awareness of the problem. Training, guidance and support should be available. The menopause itself should not be the sole motive for early retirement from the stage. A structured and easy approach is needed, so that the singer can understand what vocal techniques and /or adaptive training would be good for her, how it works, and what results can be obtained.

Secção 1 / Section 1

1. Ocupação / *Occupation*

2. Dá aulas a cantoras profissionais? / *Do you teach female professional singers?*

3. Educa estudantes femininas acerca das mudanças possíveis que talvez venham a sentir nas suas carreiras durante a fase da Menopausa?

Do you educate your female students about the possible changes that they may feel later in their careers whilst in their perimenopause, menopause or post menopause?

Sim / Não

Yes /No.

Comente por favor / *Please comment:*

Secção 2 / Section 2

Depois de ouvir e ver as gravações dos exercícios vocais por favor responda às perguntas seguintes:

After listening and watching the recordings of the vocal exercises please answer the following:

2.1 Utiliza estes exercícios com as suas alunas? Sim /Não

Commente por favor:

2.1 Do you use any of these exercises in the recording in your pupil's vocal regimen?

Yes / No

Please comment:

Secção 3 / Section 3

3.1 Acredita que algum dos exercícios gravados poderia ser benéfico durante as fases da menopausa? Se a resposta for positiva, pode explicar porquê?

3.1 Do you believe that any of the recorded exercises would be beneficial during the phases of the menopause, and if so, why?

Exercício 1 Joseph Stemple “i”

Exercise 1 Joseph Stemple “i”

Sim /Yes

Não / No

Exercício 2 Joseph Stemple – Siren em “Knoll” da ressonância mais grave para a ressonância mais aguda.

Exercise 2 Joseph Stemple – Vocal Slide with “Knoll” from the lowest to the highest resonance.

Sim / Yes

Não / No

Exercício 3 Joseph Stemple – Siren em “Knoll” da ressonância mais aguda para a ressonância mais grave.

Exercises 3 Joseph Stemple – Vocal slide on “Knoll” from highest resonance to the lowest.

Sim / Yes

Não / No

Exercício 4 Joseph Stemple – “Knoll” Dó central até sol notas sustentadas.

Exercise 4 Joseph Stemple – Sustained “Knoll” from Middle C to G.

Sim / Yes

Não / No

Exercício 5 – Trato Vocal Semí-ocluso – Soprar através de uma palhinha para dentro de água.

Sim / Yes

Não / No

Exercício 6 – Trato Vocal Semí-ocluso – Trillo de Labios

Exercise 6 – SOVT Lip Trill

Sim / Yes

Não / No

Exercício 7 “Messa di Voce” piano para forte para piano

Exercise 7 “Messa di Voce”

Sim / Yes

Não / No

Secção 4 / Section 4

Recomendações de professores.

Recommendations by teachers

4.1 Pode recomendar quaisquer outros exercícios vocais que poderiam ser benéficos?

E porquê? Comente por favor:

4.1 Can you recommend any other vocal exercises that could be beneficial and why?

Please comment:

Chapter 4: Discussion and Analysis of the Survey Results

4.1: Female Professional Singers

Of the three female professional singers surveyed, the three answered. Aged 62, 53 and 51, one identified herself as in the perimenopause, one in the post menopause, and the third participant, as not being, as far as she knows in any phase of the menopause, having not felt any alteration in general or vocal terms. The other two participants curiously also did not register any symptoms whatsoever in general terms.

4. Quais os sintomas que sente ou que sentiu em termos gerais? What symptoms did you feel/or are you feeling in general terms?

3 respostas

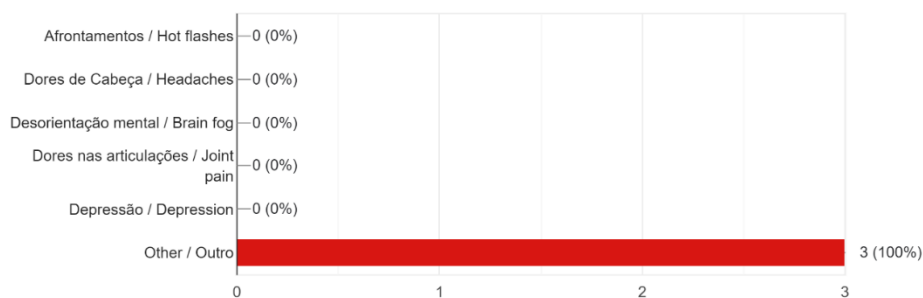


FIGURE 1: GENERAL MENOPAUSE SYMPTOMS IN FEMALE PROFESSIONAL SINGERS

Vocally, only one described having felt any kind of vocal alteration: reduced respiratory capacity but related this at the time with the use of surgical masks during the COVID pandemic.

After having watched the recorded exercises, two of the participants referred to using some of the exercises some of the time. The other concluded that she did not include any of the exercises in her vocal regimen. The VFE exercise 1 by Joseph Stemple is used by one of the singers, as is exercise 2, the vocal slide forms the lowest resonance to the highest. Exercise 3, the vocal slide from the highest to the lowest resonance also is included in two of their vocal regimens.

Exercício 3 de Joseph Stemple Siren em "Knoll" da ressonância mais aguda para a ressonância mais grave. Exercise 3 Joseph Stemple Vocal Slide "...noll" from highest resonance to lowest resonance.
3 respostas

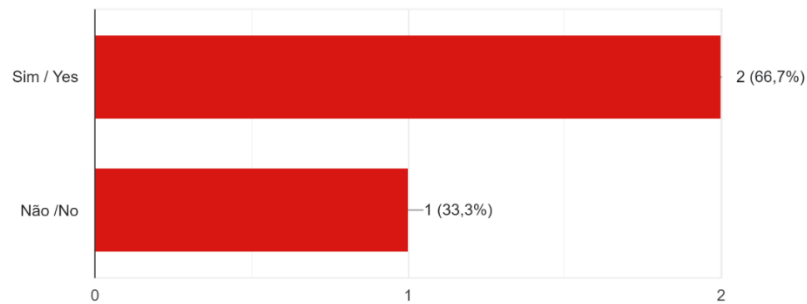


FIGURE 2: VOCAL SLIDE ON “KNOLL” – HIGHEST TO LOWEST RESONANCE

Exercise 4, the sustained notes on “Knoll”, once again is used by just one of the singers.

Of the SOVT exercises, exercises 5 and 6, exercise 6, the lip trill proved more popular with 2 of the participants using this technique in their warm-ups. Exercise 7, the Messa di Voce exercise too was recognized as being part of two of the singers’ regimen.

All three (3) singers concluded that they believed the exercises would be beneficial during the phases of the menopause, albeit two singers said they did not know of any other exercises that could be useful during this time.

2.2 Pensa que estes exercícios são úteis para cantoras profissionais durante a fase da Menopausa? Do you think that these exercises are...nal singers during the phases of the menopause?
3 respostas

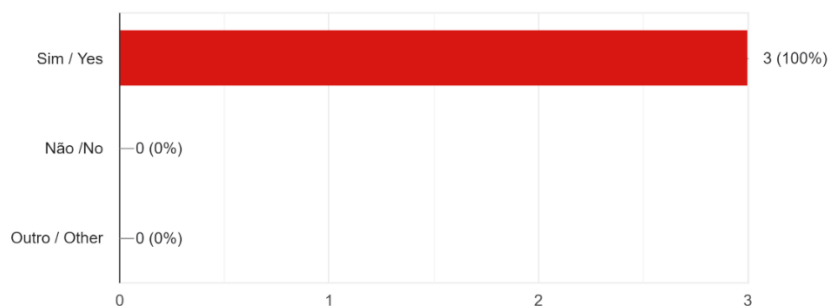


FIGURE 1: ARE THESE EXERCISES BENEFICIAL DURING MENOPAUSE?

One said she had never had the need to adapt or change her vocal routine. The third singer concluded that she may include exercises that would bring about more conscientious muscle use as well as breathing exercises that work the intercostal and diaphragmatic muscles.

4.2: Voice Teachers

All three interviewees answered the survey. All three are voice teachers. Two of the three said that they teach female professional singers, and all three teachers educate their female students, professional or not, of the possible changes that they may come to experience during the phases of the menopause.

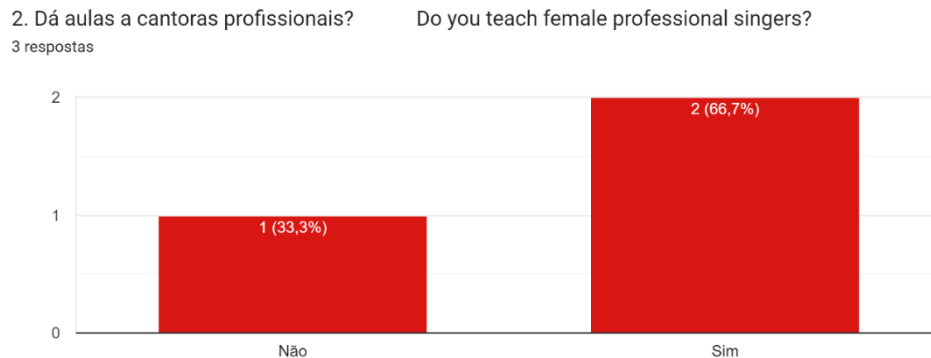


FIGURE 2: DO YOU TEACH PROFESSIONAL FEMALE SINGERS?

After watching and listening to the recordings all three teachers confirmed that they do use these exercises or equivalents with their students.

2.1 Utiliza estes exercícios com as suas alunas? Sim/Não. Comente por favor.

*Do you use any of these exercises in the recording in your pupil's vocal regimen?
Yes/No. Please comment.*

“3 respostas

1.Sim

2.Sim. Parecem ser exercícios favoráveis a manter a tão importante flexibilidade entre os registos.

3.Sim, na sua maioria. Quando não os mesmos, exercícios equivalentes”

Exercise 1, is considered beneficial, being an “important connection between sustainability of the sound and the base of the support” and good for “vowel focus and diaphragmatic support”.

Exercise 2, the vocal slide on “knoll” from the lowest to highest resonance proves unanimous in working the whole vocal register and navigating the “*passagio*” or breaks in the same.

Exercise 3, the inverse of exercise 2, follows the same principle but also obliges the student to give the correct muscular support in the descent.

Exercise 4, of the VFE exercises is reported to help stabilize exhalation, balance support in the different registers and coordinate changes of register.

Exercise 5, all teachers associated the SOVT exercise of blowing through a straw into water with correct muscular support during the exhalation. Glottal occlusion control and strengthening of the laryngeal muscles were also mentioned by one of the participants.

Exercise 6, the SOVT Lip trill was best described as helping with glottal occlusion control, strengthening the laryngeal muscles and for the relaxation of the facial and buccal muscles. The correct muscular support for inhalation and exhalation were also valid suggestions.

All three voice teachers confirmed the use of exercise 7, “*Messa di Voce*” for breath control and coordination between the diaphragm and the laryngeal muscles.

The vocal teachers were much more in tune with the exercises presented than the singers, confirming that they did talk about and give instruction geared towards possible problems that may arise in the future with regards to hormonal changes. All the exercises were recognized or used, even if they were not specifically intentioned towards alterations brought about by the menopause. The recommendations left by the three participants consist of glissandos to work the laryngeal muscles, as well as more exercises to develop flexibility to help with the change of register. Exercises with vowels and consonants, along with exercises using a larger extension were also put forward to unify the registers. Other exercises included ones to balance out the subglottic pressure, using the consonants B, D and G followed by vowels, sung with short notes in scales or arpeggios in intervals of fifths. Fricatives, Z, V and J on vocal slides or on defined notes may also be useful.

Glissandos para estabilizar a laringe e exercícios de flexibilidade para flexibilizar a laringe e a mudança de registros.

Parece-me que depois dos exercícios indicados seria importante entrar em exercícios com diferentes articulações, com vogais e depois com consoantes. Exercícios com uma extensão maior também julgo serem benéficos, de forma a uniformizar a extensão vocal.

Penso que a utilização de exercícios com consoantes com tensão sub-glótica (B, D e G) seguidas de vogal em notas curtas em sequências de escala/arpejo num intervalo de quinta possam ser muito úteis. O uso de sibilantes e fricativas com vibração laríngea (Z, V e J) em sirenes ou exercícios com notas definidas possa também ser muito útil.

4.3: Voice Therapists

Four Voice Therapists were contacted, but only three replied. Two said they hadn't treated any female professional singers with voice problems related to the menopause, whilst the third participant confirmed having treated professional singers, but not necessarily with regards to menopausal vocal problems. Two of the interviewees knew of the VFE 1 to 3. The fourth exercise, "Knoll" on a sustained note from middle C to G, was not recognized by all three.

Exercício 4 Joseph Stemple - "Knoll" numa nota sustentada no Dó central para sol. Exercise 4
Joseph Stemple - Knoll Dó to Sol sustained note.
3 respostas

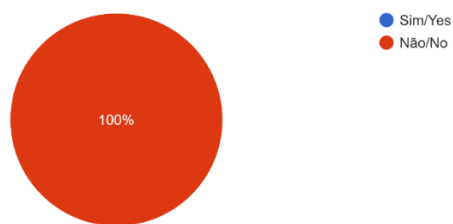


FIGURE 3: "KNOLL" FORM MIDDLE C TO G ON SUSTAINED NOTE

The SOVT exercises 5 and 6, blowing through a straw into water and the lip trill, were unanimously acknowledged. *The Messa di Voce* exercise, exercise 7, was familiar with just two of the therapists. All three therapists said they knew and used some, if not all the exercises with their patients, and that these exercises could also be used for other pathologies of the voice, depending on the case in hand. Many other exercises exist that could be adequate such as lip or tongue trills ascending and descending in scales, or on one sustained note, nasal sounds and reading in a semi sung (chanted) voice. Blowing through straws into water can be carried out whilst emitting a "sung" vowel sound such as "UUU" to engage the vocal folds, but at the same time, having a secondary focus point for the vibration.

Chapter 5: Recital

From the beginning of my master's course, I found myself going into the perimenopause. This led to the conception of the idea for this thesis. Taking into consideration the context of this thesis, the title being: Exercises and Techniques for Female Professional Singers in the Menopause, I decided that for my recital I would include repertoire by the following composers:

- R. Schumann
- C. Debussy
- H. Duparc
- G. Fauré
- R. Hahn
- H. Howell
- M. Head
- G. Donizetti
- G. Puccini

This repertoire is generally for medium voice and does not include any very high sustained notes that can cause vocal fatigue and unnecessary strain. The music concentrates on creating a strong middle of the range vocal line with higher embellishments that work the flexibility and agility of the top of the voice. I have suffered some of the “symptoms”, spoken of in this thesis, therefore some adaptation of repertoire was necessary to cater for my own specific needs. With the sudden drop in estrogen my worst and most frustrating problem was being hoarse and feeling the voice very weak. This problem had gradually been becoming more apparent as I had fallen into corrective mechanisms that only made the situation worse. The Joseph Stemple exercises discussed above (and recorded for my survey), although deceptively simple, were the basis, along with semi-occluded exercises of my therapy. By working to bring the vocal folds together with the least possible subglottic pressure, concentrating on the attack, I was able to bring back the focus into the sound. I must be very mindful with regards to my warm-up, it must be done slowly and with care not to force the attack and to gradually work up the full vocal range.

If I use my voice too much throughout the day, I still may feel slightly hoarse by the end of the day, but thankfully, it is nothing in comparison with what it was.

Chapter 6: Conclusion

Menopause can be a troublesome period of any woman's life. Even more so for professional singers who encounter alterations in their vocal production that may ultimately affect their performance. This "pilot study", as it may be called, has strived to gather existing information on the subject to provide an overview of what already exists in the world of singers, voice teachers and speech therapists concerning the menopausal voice and its associated problems, to try to identify what could be plausible techniques and vocal exercises, adequate for female professional singers. After having looked at and analyzed the survey results, I conclude that although the majority of the exercises were both recognized and utilized by all participants, they were not recognized as necessarily being useful for the menopausal voice. Voice therapists use many of them to treat a myriad of other vocal problems, whilst singing teachers use many of them in teaching, for maintenance and general vocal health. The knowledge that specific exercises could be a specific tool to help the female singer during the menopause seems to be lacking.

Without question, if female singers had the awareness and the knowledge of what is to come during this phase of their professional life, and how they should approach these changes, adequate techniques could be implicated. Pedagogues, teachers, and performers would all be more than happy to divulge, teach, and practice exercises and techniques that would benefit the well-being of their voices.

Interestingly, of the three professional singers that did provide answers in the survey, none of them, even though all were in their fifth decade, or above, had had any side effects, (or barely any), during the phases of the menopause, be it in general terms or specifically in vocal terms. Some of the exercises presented were recognized and used in their vocal warmups, but curiously only one of the singers was more consistent. Only one professional singer suggested exercises that she believed could be beneficial to female singers during the menopause. The other two interviewees made no attempt whatsoever to make suggestions, which leads me to believe, that firstly, they never received instruction in the area, and secondly, that as they have not yet suffered any "symptoms", their vocal regimen has not needed to be adapted or altered in any way. Reinforcing the idea that more research in this area is needed and the way in which it is divulged.

If student singers were to receive classes in anatomy and the physical workings of the vocal folds, along with an overview of the hormonal changes from puberty onwards, surely, they would have a deeper understanding of how their voice, and their bodies work? Every person is unique; every voice is unique. No female singer will feel the exact same side effects of the menopause as her peer. However, the knowledge that helps is at hand in the form of clear guidelines and scientifically proven exercises, surely will provide some comfort to the professional female singer. Even though they may encounter some vocal alterations during this delicate phase of their lives, if they incorporate these scientifically based vocal exercises into their practice, early retirement from the stage may not be necessary.

Bibliography

Angadi, V., Croake, D., & Stemple, J. (2017). Effects of Vocal Function Exercises: A Systematic Review. The Voice Foundation, Elsevier Inc. <https://doi.org/10.1016/j.jvoice.2017.08.031>

Boon, D.R., (1997). The Singing/Acting Voice in the Mature Adult. Journal of the Voice, Vol.11, n° 2, pp. 161-164. Philadelphia: Lippincott-Raven Publishers.

Bos, N., Bozeman, J. & Frazier-Neely, C. (2020). *Singing through the change: Women's voices in midlife, menopause and beyond*. StudiosBos Media.

Boulet, M.J., & Oddens, B.J. (1996). Female Voice Changes Around and After the Menopause – an Initial Investigation. Maturitas, 23(1), pp. 15-21. [https://doi: 10.1016/0378-5122\(95\)00947-7](https://doi.org/10.1016/0378-5122(95)00947-7). Elsevier Science Ireland Ltd.

Fiuza, B Mauro, Sevillano, Maria, L & Lã, Filipa, M.B. (2021). Singing at Menopause: A Systematic Review with Pedagogical Implications. <https://journals.sagepub.com/doi/10.1177/10298649211047884>

Fox DeMaio, B. (2013). *The Effect of Menopause on the Elite Singer: Singing Though the Storm*. [Doctoral Dissertation Shenandoah University]. Academia.edu [https://www.academia.edu/39095271/The Effect of Menopause on the Elite Singing voice](https://www.academia.edu/39095271/The_Effect_of_Menopause_on_the_Elite_Singing_voice)

Griffith, K.H., (2020). Demonstrable effect of vocal changes on singing voices of post-menopausal women. [Senior Honors Project, James Madison University]. <https://commons.lib.jmu.edu/honors202029/118>

Matthews, J. (2021). Practicing rounded lip vowels. The Complete Guide to Straw Therapy for SOVT. <https://baysidevoicecentre.com.au/the-complete-guide-to-straw-therapy-for-sovt/>

Petersen, J., (2019). *Mancini and the Messa di Voce*. <https://petersenvoicestudio.com/>

Pulte, D. M., (2005). “*The Messa di Voce and its Effectiveness as a Training Exercise for the Young Singer*”, Doctorate Proposal, Ohio State University.

Sabol, W. J., Lee, L., & Stemple, J.C., (1995). The Value of vocal function exercises in the practice regimen of singers. *Journal of the Voice*, 9 (1), pp. 27-36. [https://doi.org/10.1016/S0892-1997\(05\)80220-6](https://doi.org/10.1016/S0892-1997(05)80220-6)

Sataloff, R.T., Rosen, D.C., Hawkshaw, M. & Spiegel, J.R. (1997). The Aging Adult Voice. *Journal of the Voice*, Vol.11, n° 2, pp. 156-160. Philadelphia: Lippincott-Raven Publishers.

Suffolk Center for Speech, What is Lessac-Madsen Resonant Voice Therapy?, Long Island Speech & Myofunctional Theory, <https://www.lispeech.com/lessac-madsen-resonant-voice-therapy/>, accessed July 13, 2025.

Titze, I.R., (2006). Voice Training and Therapy with a Semi-occluded Vocal Tract: Rationale and Scientific Underpinnings. *Journal of Speech, Language and Hearing Research*, Vol.49, pp. 448-459. American Speech-Language_Hearing Association.

Van Stan, J.H., Roy, N.,Awan, S.,Stemple, J., & Hillmann, R. E. (2015). A Taxonomy of Voice Therapy. *American Journal of Speech-Language Pathology*, 26, pp. 101-125. American Speech-Language_hearing Association.

Watts, Christopher R., Awan, Shaheen N., (2019), Laryngeal Function and Voice Disorders, ISBN 9781626233911 (ebook), Chapter 8, p. 238, Thieme Medical Publishers, Inc.

Your Menstrual Cycle Explained. (2021). <https://www.livi.co.uk/your-health/your-menstrual-cycle-explained/>

Menopause: A natural part of aging. (2023). Mayo Clinic Health System, <https://www.mayoclinichealthsystem.org/>, accessed July 14, 2025.