

## Vocal Cool-Down in Voice Training: Method and Technical Considerations

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### Abstract

In addition to the artistic aspect of professional voice performance, the sportive aspect is also important. The voices of professional voice actors, who are considered just like an athlete, should be strong, flexible and durable against long-term use. Also called vocal athletes, voice performers need processes such as muscle and skill development, voice warm up and cool down as in the applications expressed as periodization in sports medicine. Vocal training should aim to prepare the student for the stage not only with its artistic aspect but also with its sportive aspect. In the vocal training process, it is important to raise the awareness of the students from the very beginning of the education and to make the sportive discipline a behavior in the name of sustainable professional vocal use. It is unacceptable for a professional athlete to do some warm-up and cool-down movements with random movements or ignorance. The same is true for seeking vocal exercises for the singer. Exercise programs structured on a physiological basis both give predictable results, and the singer knows what to do and can ensure the performance. The most important components of the conscious training program that creates vocal periodization are vocal warming-up and cooling-down. Contrary to vocal warm-up exercises, studies on vocal cool-down are not sufficient both in the literature and in vocal training. It is an important necessity to apply vocal cool-down exercises in the same routine for the tissue recovery and to return to the speaking tone after the performance and to achieve tissue recovery under appropriate conditions. Vocal cool-down exercises are basically based on stretching and slowing down. In addition to metabolic effects such as blood flow changes, decreasing the muscle tonus, and removal of metabolites from the tissue; physiological effects such as providing a comfortable low larynx position and relaxation are targeted. Vocal cool-down techniques include semi-occluded vocal tract exercises, descending arpeggios, formant maneuvers, yawn&sigh, and chewing approach. In this study, the literature on vocal cool-down exercises has been reviewed, and ideal cool-down conditions and exercises have been presented in parallel with sports physiology.

**Key words:** Voice training, vocal warm-up exercises, vocal cool-down exercises, voice health, vocal performance.

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### Introduction

Even while singing is thought of as an artistic activity, it is also an athletic endeavor. Because of this, it wouldn't be incorrect to refer to vocal athletes as professional voice performers who additionally utilize their bodies as instruments. Similar to a professional athlete, a vocal performer can only maintain a high-caliber artistic performance on stage for years provided he infuses his training and career with a sporting perspective. This viewpoint ought to come from the standpoint of the muscle world. Because the voice performer makes a sound by using his relevant muscles and carries out his performance in this way. The adage "voice is muscle" is another one that supports this idea. Professional voice users are those who

function using their voices in an artistic capacity, that use their voices to further their careers, and they require a certain standard of voice quality for this. If these persons have difficulties with their voices, it will negatively impact their professional careers in both a financial and ethical perspective. When it comes to artistic performance, the significance of voice quality and the degree to which a vocal disorder issue affects a person rises even more. In order for them to keep their job in a healthy and effective way, voice actors, especially elite voice performers, struggle to enhance their voices throughout their professional careers, beginning in their undergraduate years. This necessitates extremely thorough and efficient vocal training.

### **Voice training**

According to Wurgler (1997), voice training should be an effective, methodical, and tailored program based on the voice characteristics possessed in order to attain certain technical, musical and artistic goals. This training needs to be accomplished with broad objectives, and it should be reinforced by teaching about the anatomy and physiology of the vocal organs and ought to be completed as well with an abstract approach, using the method of exemplification based on the senses, or using the illusion method.

The construction and development of the singing voice is a challenging process because it involves numerous variables. A change in the vibrational behavior of the larynx and vocal folds during phonation is what leads to a decline in voice quality. This vibrational change is brought on by both the motor behavior pattern intended to create the correct voice that is not well placed during the training process and the unbalanced use of the muscle groups in the larynx region outside the normal physiological limits (Koçak, Dursun, Demireller, 1996, s.85). As a result of this, the performer experiences voice difficulties throughout his professional life and is unable to continue using his desired vocal performance for an extended period of time. Through the use of artistic intuition, singing pedagogy has produced numerous methods and lessons for the development of the human voice across human history. The roots of vocal pedagogy studies can be discovered in Ancient Greece, according to research on the development of voice education. Alypius and Pythagoras, two early scholars in the realm of singing pedagogy, carried out their pioneering work in ancient Greece. Due to the inadequateness of recorded materials, it is unknown if they have created a systematic approach to this problem or not. In the 13th century, the Roman Catholic church housed the earliest known documented source in the field of singing pedagogy (Uçman, 2012: 2). The early sources and tools for voice pedagogy, though, are dispersed and vague in the literature. There aren't many research on the topic that span time and origin. The majority of voice training is based on oral customs (Stark, 1999).

The field of singing pedagogy encompasses the art of singing and allows for the training of the human voice, the most natural musical instrument, in the context of both art and science. This area of study investigates subjects including what singing is, how it is taught, how it develops, how it functions, and how to apply the singing technique in a healthy and desirable way. Vocal pedagogy encompasses a broad range of singing, including the creative interpretation of songs from various genres and eras of history and the comprehension of physiological mechanisms involved in vocal production. (Özkut, 2015). In order to use one's voice correctly, beautifully, and effectively with some technical and musical sensitivity in accordance with the anatomical and physiological characteristics of the voice, in line with artistic and educational goals, one must undergo voice training. Accuracy is the production of a sound with the proper intonation in line with the individual's anatomical and physiological qualities as well as the rules that govern the sound, utterance, and sentence structure of the language that is being utilized. On the other hand, according to the proper use of the voice, the concept of beauty relates to exhibiting attractive, acclaimed, aesthetically measurably-evaluable behaviors with its volume, width, timbre qualities, and musical dynamics. Additionally, the term "effectiveness" relates to the ability to influence the listeners' strong emotions, such as excitement, enthusiasm, appreciation, and tranquillity, through interpretation that relies on the appropriate and lovely use of voice (Çevik, 2006:11). Voice training is a planned-programmed interaction process, according to Töreyn (1998), in which people comprehend the behaviors necessary to use their voices while speaking and singing in accordance with their anatomical and physiological structure, applied for planned goals, with pre-determined principles and methods.

Voice training is an applied science that has gone up as a result of the advancements in anatomical knowledge that have been acquired in recent years. It emerges as an outcome of the instructor's observations of the student's performance and the particular requirements of the repertoire. Routine exercises that are conducted in various versions and whose difficulty level improves concurrently with the growth of voice are applied during the training. Although there are specific kinds of exercises used in voice training for muscle development, it may also be desirable to try various combinations depending on the demands of the individuals. Voice exercises are the actions that people perform before and after the performance throughout their professional singing life (Narin, 2021: 2)

It takes a lot of practice and study to perform fine-tuned singing because it is such a varied undertaking. By utilizing intricate phonation techniques, singers are expected to attain the best possible voice production and performance. In addition to maintaining a functional, healthy, and aesthetically pleasing voice, vocal competence is required to generate a singing voice. Because external environmental influences frequently have an impact on singers' ability to produce sound, it is thought that sound disorders may arise in this group of professionals. Thus, in order to be good vocalists, one must be knowledgeable about voice production, adhere to proper vocal training, and use approved warm-up practices (Benninger, 2011: 111).

The fundamental element in the development of a singing voice is vocal training. Mendes et al. studied the singing voices of 14 college students, and they discovered that vocal training significantly affected the singing voice, particularly the fundamental frequency (F0) and sound pressure level, highlighting the fact that acoustic parameters might recognize these changes (Mendes, Rothman, Sapienza, 2004: 29-43). The proper and healthy use of the instrument we refer to as the human voice is essential to the growth and refinement of the art of singing (Sabar, 2008: 13). A voice that is unrestricted and capable of expressing all human emotions is delightful to hear. No matter what kind of song is being sung, vocalists need to establish a capable and sound technique that can handle the demands of the style they sing in order to achieve this aesthetic ideal. By diverting their focus from the physical demands of singing, singers are able to convey themselves more freely and artistically thanks to safety and economy in technique (Nix, 2014: 1).

Vocal exercises on a regular basis are the primary requirement for the proper use of voices by both professional singers and those pursuing this career. These exercises are designed to strengthen and stretch the voice, as well as to improve its technical quality. They are also employed for preparing the voice for performances and to ease the voice after a performance that has been very taxing on it. Professional voice users should pay attention to the routine use of these exercises. With the help of these workouts, one can develop their muscles in a way that will allow their vocal system to function properly. Therefore, the basis of the voice exercises in voice training is to improve the voice at a certain performance level and it is aimed to prepare the voice before / after the performance.

### **The sporting side of professional voice**

The professional vocal performer creates sounds by using the appropriate muscles, which results in the performance. For this reason, sports physiology sheds light on the voice performer for a sustainable and developable professional career. Because the skeletal muscles, which are mainly dealt with and developed in sports physiology, are also present in the phonatory (human voice formation) system with a similar structure. The striated muscles in question are those that support phonation. In light of this, singing pedagogy can benefit from the same ideas that apply to training and exercises in sports physiology. These principles are specificity, overload, adaptation, rest and recovery, progression, retrogression, plateau and return, maintenance, personalization, warm up and cool down.

When designing voice workouts that target particular muscles, we should especially take into account three key factors: specificity, overload, and adaptation, which are among the training principles in sports physiology. Specificity corresponds to the determination of muscle-specific, case-specific, and person-specific movement. Contrarily, overloading primarily consists of a component that involves beginning with a weight that the muscle can support and alternately increasing the resistance of ever more intense contractions. When a muscle contracts, overload means to exert resistance on the muscle. When this resistance is repeatedly applied, it can be gradually raised, which causes an increase in the amount of protein in the muscle fibers and cells (Machintosh, Gardiner, McComas. 2005). The phrase progression refers to a constantly growing load, a constantly increasing level of intricacy, and a constantly increasing level of difficulty in the process of building muscle. The software (motor pattern) and hardware (end organ) improvements made with progression training are maintained if the workouts are kept at a specific level. Both software and hardware will regress if this amount of degradation takes place. Naturally, with enough practice, the muscles and skill-behavior that have regressed to a certain extent may recover. It's possible that this return might not always be 100% when taking into account things like age, physical qualities, and ailments.

Maintaining "stage life" is the goal of a training program based on exercise physiology, sports medicine and physiotherapy. Continuous tonal exercises and well-scheduled rehearsal programs might help musicians keep this up. Using the same fundamental concepts, but tailored to the individual (according to the style, education level, education type, repertoire, stage program of the person) the vocal performer may individualize the vocal exercises. The type, time and duration of the exercises can be programmed accordingly. Adaptation refers to transfer of the new motor skill (muscle contraction pattern) to a new vocal behavior acquired by exercise. The muscles included in a certain vocal pattern are developed (made stronger and more resilient) in order to accomplish a vocal motor skill and then using this ability

automatically throughout a complex movement, or turning it into a motor behavior, i.e. singing. The entire body is the vocal instrument, but the core element is the glottic function. The glottic closure pattern is the first step in converting static energy (compressed air in the lungs) into kinetic energy (sound). Next, the vocal tract's filter function is activated, followed by the engagement of respiration and posture, and finally, the voice becomes a complete instrument.

### Periodization in professional voice performers

A professional voice performer faces various demands from other voice users, including the desire to improve and perfect his performance, boost his professional performance, and remain on stage for a long time. Applications akin to sports medicine are required to address these needs. These applications are planned by pedagogical vocology, which has its roots in and is founded on singing pedagogy.

A training plan built from a physiological standpoint is necessary for sustained professionalism. Periodization in sports medicine alludes to the methodical planning of training and exercise (Plowman, Smith, 2015). Periodization strategies can be applied to singing pedagogy (vocology practice), which takes into account the fact that "singing" is also a sporting action. It is the methodical planning of vocal habilitation and the organization of vocal exercises in accordance with the performance schedule. Pre-performance, peri-performance, and transition periods are three stages that can be used to analyze vocal periodization. Pre-performance describes the long-term preparation before a performance. Transition periods include when vocal training is carried out in between performances. Rehearsal time, which might last weeks or months, is accounted for in the time leading up to the performance. Exercises aimed at building muscle and developing vocal abilities are done throughout this time. Exercises to warm up and cool down the voice are undertaken during the performance day's peri-performance time, which begins in the morning. After the performance, the transition (active rest) period begins and lasts until the following performance day. This time span covers the steps required to return from the performance level to daily life as usual and to ensure tissue repair. Vocal training programs can actually be created for the period of collapse that happens when there is no stage action (the non-performance period), and if this scenario persists for too long, it turns into detraining (Figure 1) (Denizoğlu, Şahin Orhon, 2021).

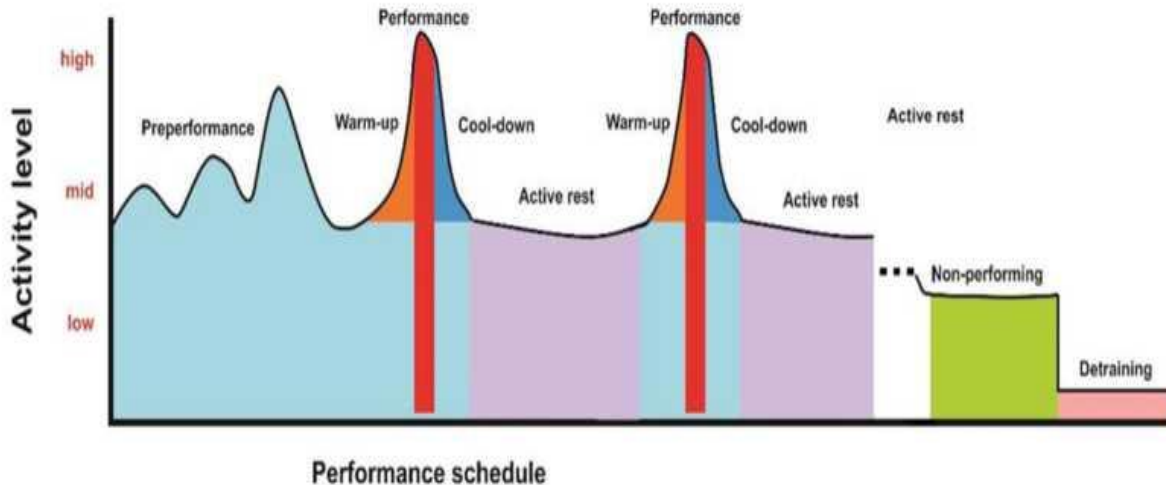


Figure 1. Activity level vs. performance Schedule

### Methodology of vocal cool down

When participants in sporting events warm up before a match and cool down after a competition, it may be noticed that these exercises are made up of predefined gymnastic motions. In other words, a football player does not warm up by playing football for a little period of time on a small field; rather, he conducts exercises like straight jogging and body stretching on the side of the field. The warm-up exercise has a pattern of gradual fastening and increasing (pitch, loudness, agility). The cool-down exercise (regeneration workout) that is conducted after the game is similar but in reverse action (slowing-down and decreasing). Undoubtedly, the warm-up program prioritizes on enhancing power and speed, whereas the cooling down protocol does the opposite. The main purpose of cooling the voice down is as in the exercise physiology in

sports, the faster removal of by-products from the tissue, such as energy production and use, and lactic acid accumulated in the muscles, prevents fatigue. Besides, It is also possible in this way to reduce muscle tension and return the muscles to their resting length and tension without fatigue.

Exercises for warming up and cooling down, one of the tenets of sports physiology, are crucial in the teaching of singing. Exercise is the fundamental component of vocal training, and when we use the word "exercise," the first thing that comes to mind is typically "vocal warm-up exercises." Along with helping the singer advance technically, vocal warm-up exercises are employed according to the specific requirements of the individual and the repertoire to prepare the voice for the performance before the performance. Stretching and slower activities are included in vocal cool-down exercises, in contrast to the lifting-stretching and rising resistance that characterize vocal warm-up exercises.

As it is widely known in sports medicine and exercise physiology, warm-up exercises aim to prepare for a high level of performance in tissues, especially skeletal muscles. For this, the aim is to deliver the food and the oxygen that will burn it to the tissue in order to provide energy first. The level of muscular activity will rise along with the blood flow. As a result, the muscles contract more forcefully and can maintain this level of contraction without tiring. Additionally, when the rate of contraction quickens, the contraction can be controlled more precisely. Metabolites build up in the tissue and cause muscle tiredness when there is an abrupt change from the active to the resting state. In addition, physiological edema and an increase in muscle tone above resting levels develop after a period of strong activity in the tissue.

Vocal warm up aims to increase blood flow and flexibility of muscles and connective tissue, allowing for a better closure of the glottis, increased flexibility of the vocal folds to properly stretch and shorten during frequency changes, and higher component sound quality. On the other hand, vocal cool down aims to prevent muscle fatigue by returning to normal muscle settings of speech voice, reducing blood flow and promoting the return of lactic acid. It reduces the edema in the tissue in this way and prevents the voice disorder that often occurs the next morning and is considered normal. Increased muscle tone is not only in the larynx but also in the vocal tract. This situation can also bring about a high larynx position. Cool down also brings the vertical larynx position to a comfortable low level.

Exercises used to get the singer physically, vocally, and mentally prepared to give a performance are called warm-ups. However, the practice of relaxing exercises for a gradual return to normal following a performance (heavy sporting activity) is termed as vocal cool down. Thus, a gradual transition from intense activity to normal (spoken voice, resting position) will be achievable. Warm-up exercises and cool-down exercises should be performed by professional voice actors before and after each performance.

### **Voice cool down: Method and basic principles**

Among the periodization strategies and one of the most important training principles, warm up and cool down exercises are the most basic elements of staying on the stage for many years.

The process of performing vocal warm-up exercises helps the singer get physically, physiologically, and mentally ready for the performance. Structural and acoustic preparation are the two physiological objectives of vocal warm-up. It is crucial for the development of transport for intense energy use, the performance of the tissue, and the contraction of the muscles with the greatest flexibility and endurance. On the other side, acoustic preparation involves identifying the voice to be generated and adjusting to the skeletal arrangement of that voice. This circumstance is recognized as "Posing the Voice" among singers. For sustained performance, it's crucial to apply cooling down after the performance (Denizoğlu, 2020:118). Cool-down must be a personalized, pre-programmed activities especially with tonal exercises that don't have any linguistic significance. Gliding from medium-high to low tones in order to relax and stretch the phonatory muscles provide a proper resting level. (Denizoğlu, 2020:118).

It's an undesirable decision to start the vocal cool-down process during backstage festivities by speaking loudly or clearing one's throat; instead, one should keep hydrated and obtain enough rest. Tonal exercises are advantageous and safe. Mezzavoce (half-voice) singing is less secure and less helpful than structured tonal exercises. If it is modified over time and applied as a routine process, the cooling time can be shortened and the task can be completed more rapidly. Passive cooling-down can be achieved by relaxing the phonatory instrument by voice rest. It needs a longer period and can hinder the subsequent performance.

### **Voice cool down techniques**

#### **Semi-occluded vocal tract exercises**

For millennia, vocal pedagogues have employed techniques known as Semi-Occluded Vocal Tract Exercises (SOVTEs) to produce voices that are both healthy and productive. The interplay between glottic

energy transformation and the vocal tract's filter function (resonance) is enhanced by semi-occluded vocal tract maneuvers (Titze, 2006). If the glottic mechanism acting as an energy transformer is considered as a boundary between two systems (filter function of the vocal tract and subglottic pressure generator), backpressure is applied to the vocal tract to increase the balance between these two systems and glottic efficiency. Programs from SOVTE have a comprehensive impact on the phonation mechanism's various aspects (respiration-vibration-resonance). Due to the backpressure effect, despite the considerable loudness, the mucosal contact pressure at the glottic level is less than expected which decreases the risk for phonotrauma (Enfo, Sundberg, Romedahl, McAllister, 2013).

The vertical larynx position influences vocal tract resonances and the biomechanical characteristics of the vocal folds. A high larynx position might be problematic because it encourages the vocal tract to constrict and the suprahyoid muscles to tense up. The resonance volume increases as the larynx descends and the vocal tract relaxes (Denizoglu, 2020).

Multiple applications are capable of being utilized to do SOVT exercises. Straws, glass or silicone tubes, masks, valves, vocal tract-narrowing techniques like trills and voiced fricative consonants, as well as hand-over-mouth exercise, can all be used to generate SOVT. The SOVTE lowers the phonation threshold pressure and provides efficient closure of the vocal folds (Titze, 2001:51). Some SOVT exercises (trills, water resistance therapy, etc) also create massage relaxation with its massage effect

### **Formant applications**

By bringing harmonics and formants together, formant adjustment enables vocal vibration to take place under more favorable circumstances (Sundberg, Fahlstedt, Morell 2005). Vocal exercises also take advantage of this connection between acoustics and biomechanics. Back vowels, which extend the vocal tract specifically to go down to low pitched tones, are employed as a cooling-off exercise. As a result, the formant frequencies are diminished and the production of the fundamental frequency is made simpler. Exercises with /u/ or /o/ vowels and descending tones are widely used in both voice therapy and voice training. The trick is to maintain the feeling of enlargement in the throat (pre-yawn position).

### **Fry register**

Although the characteristic voice was known much earlier, it has only become an identifiable register in recent years. The professional use of the fry register, which is known by different names (Vocal Fry, Pulse Register, glottic fry), can be expressed as Sthrobass (Alm.) (McKinney, 2005:94).

The associated larynx muscles can be relaxed with the correct use of the fry register. "When carried out within certain constraints, it can assist in calming the internal laryngeal muscles, which is useful when performing cooling-down exercises (Ragan, 2018: 523). By lowering the larynx and relaxing the vocal folds, a squeak register can be employed to cool the voice (Denizoglu, 2020:210). Tilting the head slightly forward and organizing the vocal tract as a /u/ phoneme may be useful in removing the squeak register. It is true that pushing and straining on the larynx while performing this would not be suitable.

### **Various voice therapy applications**

Some methods used in voice therapy, especially to cool down and relax the structures responsible for the formation of sound, can be used as cooling exercises.

### **Yawn-Sigh maneuver**

A vegetative function, yawning causes the inside of the mouth to widen, the soft palate to elevate, the hypopharynx to grow, the level of the larynx in the neck to lower vertically, the ventricular folds to straighten, and the vocal folds to relax. Phonation, the sigh that is already made immediately after the yawn, is being done right now. After this sound is captured, it is introduced to the patient and this sound is developed (Boone, 1971).

### **Chewing Method**

The chewing method's basic rationale is the notion that chewing is a reflexive, vegetative function. It was initially implemented by laryngologist Emil Froeschels (1952) in 1943. The reason for this approach is that the similar muscles are used for chewing and phonation/articulation. To put it another way, this approach is predicated on the functional connection between speaking and chewing. By incorporating the chewing

function into the wrong phonatory movements, the goal is to lessen the vocal strain when chewing, which is a normal function, and to make it easier and more comfortable for the jaw, tongue, and facial muscles to work together and comfortably. As a result, the unnecessary tension and close linkages between phonation and articulation can be relaxed, allowing phonation to become independent of linguistic pressure. This process has a number of stages. Chewing is added to the voice first, dominating the voice (hmm), and then chewing is added, with less focus on chewing. In the final stage, the voice that occurs during chewing is converted into reading and conversation (/nyyammonetwothree/ - /nyyamseeyousoon)

### Humming Approach

Within the right concentration (imaginary mask), natural frequency, and sound restrictions, the humming approach seeks to discover one's genuine voice. A frequent phonatory technique used in voice training and voice therapy is humming. The individual is given the opportunity to generate a natural hum first. The humming then continues in the same manner with other vowels ([hamm], [hemm], [himm], etc.), but with a varied pitch and volume. Then, the person is asked to hum and is then made to talk (without pause). Finally, the person is kept talking without humming, just thinking about humming. Thus, skill is transformed into behavior (Denizoğlu,2020).

### Discussion

It was decided to use the review model, one of the descriptive research methodologies, for the study considering vocal cooling activities are not yet widely used and are less successful than vocal warm-up exercises. Review models are research methodologies that try to represent a past or present situation as it is, according to Karasar (1999:77). This study, which conducted a review of the literature, intended to define the effects of cooling exercises employing both domestic and foreign sources.

According to Elliott et al. (1995), vocal warming up has an effect on the larynx muscles that is comparable to warming up other muscles. They claimed that following voice warming, muscle temperature rose, resulting in a decrease in muscular tissue viscosity. They studied the impact of vocal warming on phonation threshold pressure in a group of male and female singers, and they found that all participants benefited from it, leading them to the conclusion that, despite individual differences, there was a drop in phonation threshold pressure. The authors added that all the singers participating in the study felt that the quality of their voices was better after warming up, they could sing with less effort and control their voices more easily.

The effects of vocal warming were studied in 10 sopranos by Motel et al. in 2002, who hypothesized that warm-up exercises might make the vocal cords more viscous and stabilize the voice. Vocal warming has a favorable impact on sound quality, and acoustic analysis should be carried out, according to Amir et al. (2005). It is an effective and sensitive method for measuring this effect. Accepting the appropriate time and frequency of sound warming sessions, as well as which vocal exercises should be utilized more frequently and efficiently, is another item to take into account.

Vocal pedagogues have recently come to understand the value of vocal cool-down after singing sessions, much as they would warm up and tune the speaking voice to the singing voice or return from the singing voice range to a comfortable speaking voice after the song performance. Stretching exercises that are advised after lifting weights or running are physiologically similar to cooling-down exercises. Choral rehearsals can typically last 90 minutes to three hours. In order to define the speaking range of the voice, support the vocal mechanism, and develop or restore appropriate muscular relaxation, tone, and flexibility after a protracted vocal activity, cooling-down exercises are beneficial (Smith and Sataloff, 2003:234).

Following a challenging activity, it's critical to cool down the voice. Since lactic acid is largely created in the muscles during exercise, cooling the muscles helps the acid disperse, preventing an accumulation that would impair the muscles' capacity to function. Bringing our voice back to a relaxed, normal state by cooling it down is also beneficial. It is often observed that once someone starts talking loudly, they tend to keep up the volume even when it is unnecessary. Additionally, we can avoid continuing to overexert ourselves by calming the voice down (Deevore and Cookman, 2009:116).

In the study by Mezzedimi et al. (2020), 32 female students underwent vocal warm-up and cool-down activities with strong vocal activity, and the results were recorded both before and after. A considerable drop in F0 (fundamental frequency) was detected following vocal cool-down exercises, indicating the beneficial impact of voice cooling on the transition from the post-performance condition to the baseline. Additionally, it has been established that voice cooling promotes vocal healing, lowers vocal cord tension, and aids in the restoration of speaking voice.

Vocal cool-down exercises, when done after a long period of singing, help the body recover more quickly,

restore the natural speech tone, and significantly improve one's perception of their overall vocal health. This perceived sense of improvement has not yet been determined whether psychological or physiological. There is no doubt that singers and these small alterations to their voices are incredibly compatible. By using biomechanical, aerodynamic, and psychological measurements, it is anticipated that the advantages of cooling workouts would be confirmed in future studies (Ragan. 2018:525)

A person sings more comfortably and effectively when he has a positive self-perception of himself. It can be maintained that vocal cool down exercises can additionally be advantageous due to their ability to restore the speaking voice to normal and give a vocal sense of relaxation following a taxing performance, similar to how vocal warm-up exercises give a sense of trust and comfort during the pre-performance preparation stage (Narin, 2020).

Mchenry et al. (2015) performed a study to observe opera artists before, during and after performance, and they argued that vocal resting may facilitate the healing of sound.

The review of the literature did not reveal any information about the effects of vocal cooling down time. In light of this, it should be kept in mind that using song voice should be followed by a vocal cool down and rest period in order to repair vocal tension and avoid the stress of singing from becoming permanent. Vocal cool down can aid in the faster healing of muscles for repeated epithelial damages or for repeat performances without vocal cord muscle exhaustion. The vocal cords would practically require constant repair if the conditions persisted. The data so far indicate that vocal cool down was insufficient to put the vocal fold muscles back into modal states. Vocal cool down should ease tension in the muscles, lower the risk of injury, and support tissue regeneration for a fresh musical performance (Onofre et al. 2017: 129).

## Results and Suggestions

Professional vocal performance includes both an artistic and an athletic component, both of which are crucial. In compliance with the principles of sports medicine and exercise physiology, the voice should be tuned up for performance and retained ready for the next event following performance. In this regard, vocal cool down is less well known, when compared to vocal warm up, but just as critical to vocal athletes. Clearly, further experimental study on vocal cool down exercises and methods for professional vocal performance is required.

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