

## **Aligning science and tradition : Voice culture - the lesser known secrets**

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### **Abstract**

*Traditionally in INDIAN CLASSICAL MUSIC the term voice culture was an ignored term or heard in rare. Very few got the crux of it though the science behind wasn't understood. The science of voice culturing did exist in rarity though little or no importance was given for the thought. It's a fact accepted that the ancient vocalists were successful with better range of voice and that they practiced an uninterrupted vocal rendition with least technical support unlike the performers of the present day, who need a lot of conscious efforts to be put in to reach there. They did probably have few secretive methods which lost in time during its journey through generations. This paper tries to put forth the traditionally practiced methods of voice management with the scientific facts behind and draw sync between two to result in some best practices for the musicians of the generation.*

**Keywords :** Voice culture, True tone, False tone, Anatomy, GuruShishya, Head singing, Deep throat singing, Voice management skills.

### **Research Paper**

**Voice** Culture involves Traditional and Scientific Methods to improve the quality of the voice. Scientific methods of voice training need to be introduced for further improvement with our present day empirical methodology. The process of enriching the voice is known as voice culture. It involves training the voice to sing or speak in a particular desired way. It is a procedure where one learns to master one's voice. This study includes traditional and scientific methods to improve the quality of voice. Technically, the term 'voice culture' is perceived as molding the voice through training in order to produce sound and musical movements which are distinctively identified from other music cultures (Chinthaka, 2014). It's baffling to see the singers from yester years perform with great ease and controlled good voice modulation with least or no technical or technological support. Not aware or with very less knowledge of the science behind voice production they managed to maintain a consistency in their rendition. In other words science existed in them unconsciously. Classical music, especially the Carnatic Classical vocal is very strenuous for the voice. It is known for its intricate details without the knowledge of which the rendition is considered to be missing the way. It

demands a rigorous practice methodology and thus resulting to a lot of stress physically. And the region affected the most is the throat muscles. Now, it's the need of the hour to know the secret behind the efficiency of the ancient performers and the scientific reasoning for the same.

#### **Voice Culture (Literature Reviews):**

In "Sangeeta Ratnakar" sarira is a term which refers to a gifted voice without any regular practice. "Sareera" is a "natural voice". The Voice-training method turns the gifted natural instrument into an exquisite and melodious "Vadhyam" or instrument.

Voice is the only instrument that can be cultivated, improved and cultured by variation of pitch, intensity and timbre (tonal quality). Indian Classical Music is based on spirituality. For a vocalist of Indian Classical Music "Voice" is to sing the glory of God. Any determined effort focused towards attaining perfection is called "Sadhana". (Banerjee, 2013)

From the past till date in Indian classical music the importance is given to the learning of Music and Raga System. The whole of Indian Classical music depends on

face to face learning or Guru-ShishyaParampara. Not much of literature is involved. That's why the teaching methods are very unstructured. We cannot put it down in points anywhere. Except the passing reference to the Merits and Demerits of the voice in our ancient musical literature and a few articles by musicologists in the technical journals, there are not many publication dealing with the subject of voice Culturing.

The term Voice Culture is familiar in Western music .The anatomy of voice and music both goes together. The students are admitted to music classes only after undergoing initial steps of physiology and psychology test and at every stage, the team monitors the use of the voice by the student. But, for Indian classical music voice culture is a new subject for research and study. However voice experts like late Pt. Sunil Bose, Shri T. V. Gopalkrinan, AnanthVaidhyathan, Prof. T. Unnikrishnanhave thrown light on this topic with a lot of efforts and in the view of these musicians, it is evident that we can get benefit from both Western and Indian music systems in context of voice culture, where both scientific and traditional aspects are involved.

How the great vocalists maintain their voices as they are able to sing well even to today? With them voice-culture might have been instinctive. It's a matter of fact that to succeed as a good vocalist onehas to know the voice related aspects and Voice Culture covers all the attributes in this area.The interesting fact is, it is helpful in other professionals also like Public Speakers, Actors, Teachers and whoever related with impressive voice.

In Indian Classical Music the oral traditions had no knowledge of the actual anatomy and physiology of the singing voice. Though SangeetRatnakar speaks about the advantages of exercises (Yogasana) from Yoga, it does not give thorough insightsto it within the oral musical traditions.

The main purpose Indian Classical music was the presentation of music not the Voice. That why the attention was not paid to the cultivated voice. The knowledge of the actual anatomy and physiology of the singing voice was not practiced. The oral traditions have never had any knowledge of the actual anatomy and physiology of the singing voice. Voice culture has been a relevant and necessary subject whether the style of music is Carnatic,

Hindustani or Western; the fundamental techniques for good voice production can be applied effectively to all systems. Once the fundamentals are understood, we should then strive to work on the specific aspects of that music system and strengthen the foundations. Here we will try drawing a parallel between scientific and traditional methods of Voice culturing.

### Scientific analysis of Vocal Chords



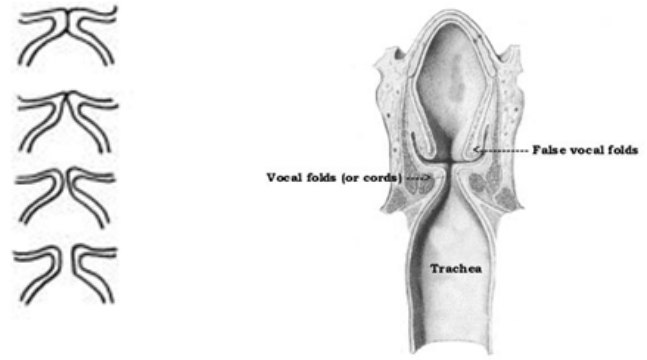
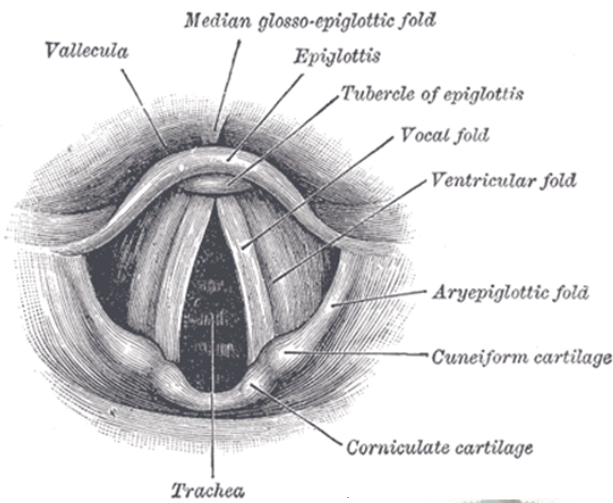
Scientific and the medical aspect of voice culture are to maintain Voice hygiene and preserve the voice from voice disorder. There are difference between musical knowledge and presenting that musical knowledge by impressive singing. In the past many

musicians ignored the importance of a melodious voice, instead they gave importance to the knowledge of the music and the different techniques of music. Voice training has become imperative in the current scenario; it helps in Voice flexibility and ensures Control of Breath, Uniformity in voice, Clarity in voice, Articulation, Resonance, Vocal range and more. The proper knowledge of the physiology of human voice helps to bring all these concepts in to effect.

Let's understand the anatomy of a singers' voice. There are two types of vocal folds (also known as vocal cords) which are referred to as 'true' and 'false'.

The latter protect the more delicate 'true' folds and are located just above them.

True vocal cords are two pieces of tissue which are located above the windpipe and stretch horizontally across the larynx. They are controlled via the Vagus nerve and due to less blood circulation itappears light or almost white in color. They differ in size between 12.5 mm and 17.5 mm in length, usually being larger and thicker in men than women whose body structure is usually lighter and less muscular. Just as our bodies, hair and features differ between each individual, these variations in size result in voices with a wide range of notes, tones and pitches so that every voice is unique.



The vocal folds opening and closing.



A vocal fold. (Microscopic illustration)

When we hold our breath, the vocal folds close, when we breathe in the vocal folds open and they vibrate as air passes through the larynx including when we speak or sing (known as phonation). They oscillate so quickly (opening and closing 440 times per second) when singing, that the movement cannot be seen properly by the naked eye without slowing down the film.

**How singing is created (vocal anatomy)**

Although there’s a part of the body called “the voice box” (also known as the larynx), singing and speaking require far more than the use of this one organ. Singers create sound by using the abdominal and back muscles, the rib cage, lungs, the oral cavity, and more.

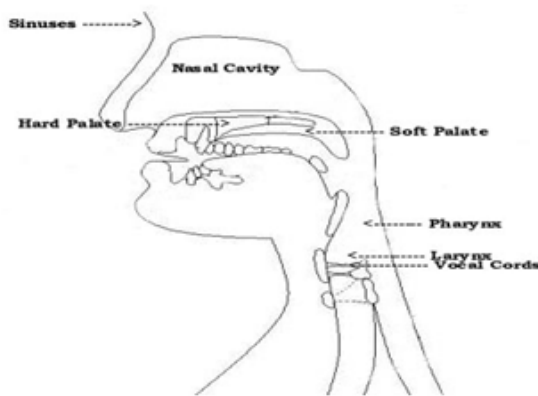
The vocal cords (medically, they are “vocal folds”) are membranes that snap open and closed while singing, speaking, or making noises. As air pressure builds up against them, the folds snap together and a sound is created. When they are snapped gently, a soft sound is heard; when they snap forcefully, a loud sound is the result. The quicker the cords open and close, the higher the resulting pitch will be. (These are durable little suckers: vocal cords open and close 100 times per second during normal speech.)

The “false” vocal folds should not be confused with the folds described above. The false vocal folds sit just above the true vocal cords and prevent food, etc. from entering the trachea when swallowing. They typically don’t play a major role in speech or singing.

When singer starts to sing he begins by breathing. The muscles of the larynx bring the vocal cords together. They stay closed until enough breath (i.e., enough pressure) builds up and a burst of air escapes through the cords. As you run out of breath, the vocal cords are once again drawn together. So now it’s evident that the vocal cords do not work like a stringed instrument; they don’t produce sound by vibrating against each other. Sound is actually produced by the pressure changes created when small jets of air pass through moving vocal cords. This is why it can be helpful to think of breath control as the steam engine that makes the machinery of singing function.

The picture above is a microscopic illustration of the vocal cords. You can see that the very term “cord” is misleading, since the cords are actually folds of tissue. These cords, or folds, are made up of several layers, and in a healthy cord, the uppermost layer is loose.

The top illustration on this page will give you an idea of how the vocal folds open and close during sound making. They don't open all at once; the lower part opens first, then gradually the cords open wide...then close again. Anything that interferes with this process (like a swelling from incorrect singing, smoking, etc., or small lesions that cause hoarseness) reduces voice quality.



The Larynx or colloquially the voice box (or larynx) rests in the neck and is made of four basic components: the “skeleton”, “intrinsic muscles” (which move the vocal cords, among other things), “extrinsic muscles” (which adjust the position of the larynx in the neck), and “mucosa”. The intrinsic muscles alter the position, shape, and tension of the vocal cords and can bring them close together, spread them apart, or stretch them in length.

The Resonators: The tongue, palate, oral cavity, nasal cavity, sinus cavity, chest cavity, pharynx, and other anatomical structures act as resonators for singers; they are mostly responsible for vocal quality. The vocal cords themselves produce only a “buzzing” sound; the resonators are necessary to create music and speech. When we begin talking about “placement” of the voice, we will mostly be dealing with the resonators, and finding out how to use them to their best advantage.

A common method of finding “good” placement is to sing while smiling inwardly. This raises the cheekbones and allows the vocal sound to enter and resonate inside the area called the “mask” (you’ll feel vibrations in the teeth/lips, cheekbone, nasal cavity, and possibly the forehead.)

- The highest notes are resonated in the Sinus cavity
- The head voice lies in nasal cavity, teeth/lips, and the upper pharynx (these three together—some is

referred to as “the mask”). This area is also important for high belting.

- The chest voice resonates in the oral cavity, soft palate, and middle pharynx
- The upper chest cavity and lower pharynx are where much of your chest voice singing resonates.

The Power Tool: What we typically call the diaphragm, or our “support system,” is the power source for singing. Actually, the anatomy of the “support system” is quite complicated and not completely understood even by medical experts. The purpose of the support system is to “generate a force which directs a controlled air stream between the vocal folds which is necessary for vocalization to occur.” The principle muscles that help us breathe in are the diaphragm (a dome-shaped muscle that extends along the bottom of the rib cage), and the “rib muscles.”

Many of the muscles used for expelling breath are also in the “support system.” These muscles either raise abdominal pressure, forcing the diaphragm upward, or lower the ribs and breast bone, thereby compressing air in the chest. The chest and back muscles are also involved.

In the voice, we can change the muscle tension and the pressure to vary the pitch. However, to cover a range of a few octaves, we usually need to use different registers (Garcia, 1855). The distinctions among registers in singing are not always clear, however, because changing registers corresponds to both laryngeal and vocal tract adjustments (Miller, 2000). The vocal folds can vibrate in (at least) four different ways, called mechanisms (Henrich, 2005).

Mechanism 0 (M0) is also called ‘creak’ or ‘vocal fry’. Here the tension of the folds is so low that the vibration is not periodic (meaning that successive vibrations have substantially different lengths). M0 sounds low but has no clear pitch (Hollien and Michel, 1968). Experiment: if you hum softly the lowest note you can and then go lower, you will probably produce M0.

Mechanism 1 (M1) is usually associated with what women singers call the ‘chest’ register and men call their normal voice. This is used to produce low and medium pitches. In M1, virtually all of the mass and length of the vocal folds vibrates (Behnke, 1880) and frequency is regulated by muscular tension (Hirano et al., 1970) but is also



affected by air pressure. The glottis opens for a relatively short fraction of a vibration period (Henrich et al., 2005).

Mechanism 2 (M2) is associated with the 'head' register of women and the 'falsetto' register in men. It is used to produce medium and high pitches for women, and high frequencies for men. In M2, a reduced fraction of the vocal fold mass vibrates. The moving section involves about two thirds of their length, but less of the breadth. The glottis is open for a longer fraction of the vibration period (Henrich et al., 2005).

Mechanism 3 (M3) is sometimes used to describe the production of the highest range of pitches, known as the 'whistle' or 'flageolet' register (not to be confused with whistling) (Miller and Shutte, 1993). Little has been published on this: we have been researching it lately and have published two papers on it (Garnier et al, 2010; 2012).

Although some people use M0 in speech, especially at the end of sentences, and coloratura sopranos are said to use M3 in their highest range, speech and singing usually use M1 and M2. Men and women typically change from M1 to M2 at about 350-370 Hz (F4-F#4) (Sundberg, 1987), which is often called a 'break' in the voice. Consequently, with their lower overall range, men typically use M1 for nearly all speech and most singing. However, in some styles of pop music and some operatic styles, men use M2 extensively: men who sing alto are usually using M2. For women singers, the situation depends on vocal range. Sopranos sing in M2 and usually extend its range downwards to avoid the 'break' over their working range. High sopranos may use M3. Altos often use both M1 and M2.

The anatomical study gives a clear idea of that the singing is not just related to voice box or vocal cord but there are a lot of other parts of a human body that is involved to achieve it.

Drawing a parallel between scientific and traditional methods As mentioned earlier the singers of the ancient days had neither given importance to voice culturing nor had they ventured to know much about the anatomy of vocal chords. But there are a few references to this in the Sangeetha Damodaraa Sanskrit literature written by Dr. Hariram Acharya. Traditionally the voice culture was called as KANTA SAADHANA. Here there is a very important fact that "In the traditional system of teaching,

scientific methods of vocal exercises were not explored. Though classical system of music has been enriched with many exercises to develop the Kanta Saadhana, a comprehensive study of all the scientific aspects related to voice cultivation and also the practice of technically developed exercises will help the singers to analyze the own voice and to manipulate the vocal apparatus for the perfect voice modulation. From the information given above (The Scientific analysis of Vocal chords) it's very clear that the basic component to produce the desired sound from vocal chord is the AIR that travels through the entire system of human breathing. The voice box does the duty of producing the desired sound with this basic component. The movement of the diaphragm and other muscles like the ribcage muscles and the chest muscles decides the quality and quantum of sound produced. So if these muscles are trained methodically the desired quality of Voice may be generated. The most basic level of voice culturing is to breath in a proper or rather a prescribed way. The next level would be the usage of the Jaw, the teeth, tongue and the lips.

These are the few techniques of Voice training methods followed in Indian classical music "Mandra Sthaayi", "Fast Phrases", "deerghaswarasaadhana", "Daatu Prayogasaadhana to name a few. These practices help in opening up the range and volume, optimizing tonality in Carnatic Music system. When a detailed observation is done over this it's quite evident that the singers then emphasized on the Breathing techniques which is otherwise known as pranayama in YOGA.

#### **Need of the Hour:**

The general impression is that the quality of the singer's voice is darker. It's like when a person yawns and speaks at the same time. This is also referred to as covered voice and the effect is described as Covering. The pharynx should be widened in the singing during which the singer experiences the sensation of yawning. The Indian classical singers, especially the Carnatic singers have always been hesitant to adapt this method of singing fearing that the gamaka system (oscillating notes) might get affected. Acoustically the expansion of the lowermost part of the pharynx is equivalent to an increase in the length of the vocal tract. This method helps in increasing the volume and there is a better voice texture. The method can be imbibed only by the practice and rarely does it come

naturally. The clarity and audibility is achieved by the above mentioned method. The singer's voice has to be invariably loud and audible when in an orchestra. In order to modulate the loudness according to the musical context the singer would need to continually vary the vocal efforts. This will strain the vocal folds. Regulating the jaw opening is a task but it's needed. The challenge here is to adapt the same in the Indian musical forms. The Carnatic music has a prominent Gamaka style and to add to the complexity there is sahithya (the lyrics) that is to be pronounced cautiously. It is very important to know how different vocal style training affects both the singer and the presentation of singing style.

### References:

1. Banerjee, M. (2013), Methods To Improve The Quality Of Voice Through Voice Culture In Hindustani Classical Music', unpublished Ph. D thesis, retrieved from [http://shodhganga.inflibnet.ac.in/bitstream/10603/7570/4/04\\_introduction.pdf](http://shodhganga.inflibnet.ac.in/bitstream/10603/7570/4/04_introduction.pdf), accessed on 31/12/2-15.
2. Behnke E. (1880). The mechanism of the human voice, 12th ed. London: J. Curwen & Sons, Warwick Lane, E.C.
3. Chinthaka P. Mettegoda (2014). Voice Cultures in Hindustani Classical Music. UPM Book Series on *Music Research - Music and Mind*. Edited by Gisa Jähnichen, Made Mantle Hood and Chinthaka P. Meddegoda, vol. 6:71-88
4. Garcia M. (1855). *Observations on the human voice*. In: Proc. Royal Soc. London, p. 399-410.
5. Garnier, M., Henrich, N., Smith, J. and Wolfe, J. (2010) "Vocal tract adjustments in the high soprano range" *J. Acoust. Soc. America*. 127, 3771-3780.
6. Henrich, N., d' Alessandro, C., Doval, B. and Castellengo, M. (2005). "Glottal open quotient in singing: Measurements and correlation with laryngeal mechanisms, vocal intensity, and fundamental frequency." *J. Acoust. Soc. Am.* 117: 1
7. Hollien, H. and Michel, J. F. (1968). "Vocal fry as a phonational register." *J. Speech Hearing Research* 11(3): 600-604
8. Miller, R.L. (1959). "Nature of the Vocal Cord Wave" *J. Acoust. Soc. Am.*, 31, 6, 667-677.
9. Miller, D.G. and Schutte, H.K. (1993). "Physical definition of the 'flageolet register'" *J. Voice*, 7, 3, 206-212.
10. Miller DG. (2000). Registers in singing: empirical and systematic studies in the theory of the singing voice. Doctoral dissertation, University of Groningen.
11. Sastri, Subrahmanya (1943), *Sangitaratnakara of Sarangadeva*, The Adyar Library publications.
12. Sundberg, J. (2001), 'Level and centre frequency of the singer's formant', *J. Voice* 15, 176-186.