

# Vocal Warmups and Its Effectiveness in Professional Singers

John O Pious, Satish Kumaraswamy

**Abstract:** *An occupational or professional voice user is someone whose voice is required for their employment. Warming up, stretching, and relaxing the muscles of the vocal chords are all basic vocal warm-up exercises. Voice when perceived by different people has different effects or varies in terms of quality subjectively. These changes can be based on the pleasing quality, clear articulation, appropriate loudness, expressiveness, unobtrusive pronunciation and dialect. Minimal knowledge is available till now about the acoustic factors that vary during the vocal warm-ups in different conditions. Therefore, the current study focuses on finding the variances and levels of variations among different acoustic variables. Voice samples were collected from the participants at three different conditions and different factors were analyzed. The responses were recorded with the help of a studio quality headphone with mic and were analyzed in PRAAT software. The obtained measure of Acoustic parameters was recorded and was analyzed statistically and was comparison was done. The results showed insignificance of the data when undergone comparison and the initial hypothesis was proved wrong.*

**Keywords:** Voice, Singers, Professional singers, Vocal warmup, effectiveness

## 1. Introduction

Voice or phonation is produced by vibration of the vocal folds. This phonation is produced by expiratory air flow coming from the lungs, passing between the approximated vocal folds and setting the vocal folds into vibration.

An occupational or professional voice user is someone whose voice is required for their employment. Teachers, clergy, salespeople, courtroom attorneys, telemarketers, receptionists, and others utilize occupational voice. Singers, actors, and broadcast personalities are all professional voice users. Voice and verbal communication are vital parts of what they do for all of these people.

<https://www.uofmhealth.org>

Voice when perceived by different people has different effects or varies in terms of quality subjectively. These changes can be based on the pleasing quality, clear articulation, appropriate loudness, expressiveness, unobtrusive pronunciation and dialect.

Warming up, stretching, and relaxing the muscles of the vocal chords are all basic vocal warmup exercises. Because singing is a physical process, it requires the cooperation of all parts of the body. For this to happen properly, the body must be in good health. Unnecessary pressure on the vocal chords caused by singing over the vocal range degrades tonal quality, which eventually leads to degradation of voice quality. These exercises help us get set with the correct pitch, diction, vocal strength, breath control, emotional balance.

All of us wish our performance touches the heart and soul of the listener as the voice is the window to our soul and we, as singers, are letting the audience to get a glimpse of our soul through our voice and let them experience the same emotions we go through. For blood to be circulated to all parts of the body that make up the voice box, loosen the vocal chords first by releasing tension around the vocal muscles. This helps in singing for a longer duration without incurring damage to the voice.

Warm - up exercises for the voice are thought to help reduce vocal fold injury in professional voice users. A regular vocal warm - up programme is considered vital for professional singers and students of singing. Although vocal warm - up is seen as a crucial phase in the preparation for a performance by skilled singers, the particular effects of vocal warm - up on future singing are unknown. Some authors have suggested that it has immediate effects on vocal quality however; there is no scientific evidence to support this (Sundberg, 1987; Hixon, 1991 cited in Helmbrecht, C. A. (1993))

Although the specific effects of vocal warm - up are unknown, it has been considered to be a rudimentary step, both as a daily routine and prior to performances (Schumacher, 1974 cited in Helmbrecht, C. A. (1993)). Individual vocal warm - up procedures differ significantly. Based on personal choice and/or the unique requirements of the musical piece to be performed, each individual develops a warm - up practice that perfectly serves her or his requirements. Vocal warm - up has now been associated by some vocal trainers to improved vocal quality.

Some singers prefer to warm up by phonating at low pitch and intensity levels and taking frequent and longer breaks between exercises, while others prefer to warm up by phonating at higher pitch and intensity levels and without resting in between exercises. If one practices early in the morning, it is advisable to start with vocal exercises as they help set the voice quality after being unused for a long duration when asleep.

When the voice has not been used for a long duration, mucus builds up in the mouth and nasal cavity, and singing directly, especially the higher notes, without warm up, reduces the voice quality in such situations. The vocal exercises are tailor - made to strengthen the lungs and build up the stamina levels, so as to lubricate the throat and provide moisture.

Despite the widespread and long - standing application of vocal warm - up in the singing community, little is known about how it influences the physiologic characteristics of the

Volume 10 Issue 11, November 2021

[www.ijsr.net](http://www.ijsr.net)

Licensed Under Creative Commons Attribution CC BY

vocal folds and also the voice's acoustic parameters. There are disagreements in the field about the most efficient vocal warmup workouts and how they influence an individual's voice. Regardless of the fact that singers consistently indicate that vocal warm - up promotes voice quality, previous studies was unable to identify how vocal warm - up benefits the voice.

## 2. Need of the Study

According to the preceding summary of literature, the acoustic measures of voice and its variances across different conditions would be beneficial for future references and better personalisation of vocal warmup regimens. Minimal knowledge is available till now about the acoustic factors that vary during the vocal warmups in different conditions. Therefore, the current study focuses on finding the variances and levels of variations among different acoustic variables.

## 3. Method

### Aim of the study

The aim of the study was to find the variances of acoustic variables Jitter, Shimmer, F1, F2, F3 and F4 of voice among different conditions, in professional singers.

### Participants

20 participants who has acquired training in music for at least one year

### Inclusion criteria:

- 20 singers participated in the study
- Singers with training in music for at least 1 year
- Singers within the age range 18 - 45

### Exclusion criteria:

- Singers with any voice conditions associated with any pathologies
- Singers taking medicines regularly for diabetes and any other problems
- Singers, females within 7 days prior to the menstrual cycle and post menstrual cycle

### Procedure:

Prior to participation, a consent form was reviewed with each subject to establish an agreement of participation in the study. Each subject participated in three experimental conditions, varying in the type of warmup completed. Each person was instructed to not indulge in any type of vocal warmup or singing, throughout the days of participation.

### Condition A:

Voice samples of the subjects were collected without any prior vocal warmup or singing

### Condition B:

Voice samples of the same subjects were collected with individualized vocal warmups performed, prior to the recording.

### Condition C:

Voice samples were collected after the performance of specified warmups, to improve vocal quality.

### Instructions for specific warmups:

#### The Hum:

To facilitate better posture of these muscles during singing, so that they remain lifted at all times, to the point where upper teeth are seen, the purpose is to exercise the cheek muscles. It "allows vibrating air or breath to move up to the resonant bone structure and cavities of the brain, bringing the voice to life."

When you hum correctly, your cheek muscles gradually raise and your lips make the sound of a quiet M. Humming the melody of the song "Oh, What a Beautiful Morning, " or just a line at first if you want, until you get used to it, is a good way to start. Lift your cheeks slightly, softly pout your lips, and hum with a delicate M on your lip.

Allow the sound of the hum to rise freely and naturally. Take as many breaths as you need. Feel your head flexible and free on your neck as you continue to hum, as if it could nod softly.

#### The Yawn - Aw

The goal of this exercise is to help you strengthen your soft palate muscles and to make it easier for you to move your soft palate in harmony with your cheek muscles for proper voice resonance.

Take your mirror with you. As you open your lips, lift your cheeks and allow your lower jaw drop softly and easily. Gently and easily yawn now. As you yawn, the arch of your soft palate will rise. Take a peek at it in the mirror if you want to see how it raises. You don't have to look at it if you want to keep practising yawning.

#### Bilabial and Lingua - Alveolar Trills

The goal is to make the tongue and lips "loose" and "free," allowing them to vibrate freely when air passes by.

Begin singing the following exercise in your low middle range and work your way up through the octave (i. e., 8 times).



Figure 3.1: Describes the sheet music representation of the BILABIAL AND LINGUA - ALVEOLAR TRILLS

**The "Kee - Kah - Kee" Exercise**

The objective is to strengthen the velum so that it can vibrate more evenly and resonate better. Before you begin, sigh loudly and say "kah." This spoken "kah" immediately aligns the soft palate in the proper posture. Always think of singing

the tone forward when singing back on the soft palate. Begin singing the following exercise in your low middle range and work your way up through the octave.

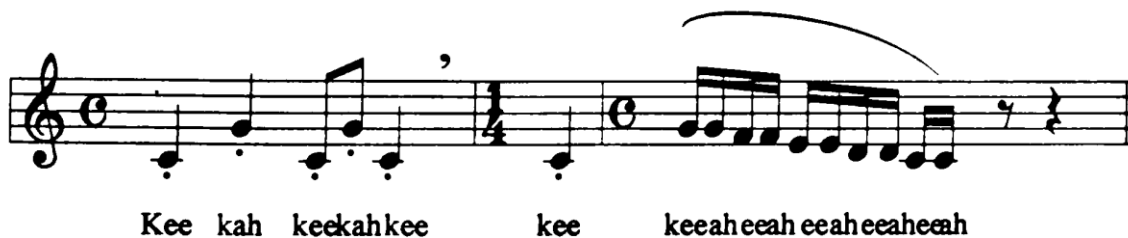


Figure 3.2: Describes the sheet music representation of the KEE - KAH exercise

**The "Snuff Zoh - Zah - Hum" Exercise**

The goal is to widen the nasal cavity and let the singer feel supported in the lower abdomen area, allowing for a more consistent vibrato.

Put your hands on your waist and do a short snuff, just as though you were snuffing your nose, very easily. The lower abdominal area should spring out (not be pushed out) on the snuff. Sing the following exercise, beginning in your middle range.



Figure 3.3: Describes the sheet music representation of "SNUFF ZOH - ZAH - HUM" exercise

**The "Zay - Luh - Zah - Luh" Exercise**

The goal is to help you focus on the tone. Use the "inner smile" posture, in which you seal your mouth but not your teeth and smile as if you're smiling at someone

in the room but don't want the other person to see you smile. Begin singing the following set of triplets in your upper middle range while maintaining this position. Rep this process five times.



Figure 3.4: Describes the sheet music representation of "ZAY - LUH - ZAH - LUH" exercise

Randomization of the order of experimentation was done to reduce the chances of sequencing effects.

least and one more repetition of the same was done. Subjects were then asked to do the same at their highest possible pitch. Hence vocal spectra at two different pitch levels were generated for each subject in three experimental conditions.

Recording was done in a place with minimum environmental noise. The voice samples were recorded with SENNHEISER HD 400S headphones in CUBASE 5.0 software without auto tune. Subjects stood at a distance of 6 inches from the microphone.

Recordings were processed in PRAAT. High pass filter is used to reduce any artifact that might have been present in the acoustic signal. The two second segments at the middle of the vocalizations are used for the acoustic analysis. The following five acoustic measurements were then calculated from each sample. (1) Percentage jitter (2) percentage shimmer (3) signal to noise ratio, (4) f1, (5) f2, (6) f3, (7) f4.

Each subject was instructed to produce and sustain the vowel /a:/ in a comfortable pitch and loudness. Each subject was instructed to sustain phonation for 5 - 10 seconds at

**Analysis**

The collected data was acquired and analyzed with the help of formant analysis and the mean percentage of both Jitter and Shimmer was obtained. The acquired data wsthen subjected to Analysis of variance. (ANOVA)

**4. Results**

The aim of the study was to find the variances of acoustic variables Jitter, Shimmer, F1, F2, F3 and F4 of voice among different conditions, in professional singers and these were the results obtained.

**Table 4.1:** Describes the variances in the five acoustic parameters across the three conditions taken into consideration.

Report						
Parameter		N	Mean	Std. Deviation	Repeated measures ANOVA p value	
%JITTER	Before warm up	20	0.326	0.099	0.849	NS
	Self warm up	20	0.341	0.108		
	Specific warm up	20	0.335	0.126		
%SHIMMER	Before warm up	20	3.734	1.573	0.833	NS
	Self warm up	20	3.639	1.473		
	Specific warm up	20	3.766	1.432		
F1	Before warm up	20	697.598	133.300	0.499	NS
	Self warm up	20	690.349	125.517		
	Specific warm up	20	708.798	140.070		
F2	Before warm up	20	1324.854	204.298	0.167	NS
	Self warm up	20	1281.300	185.676		
	Specific warm up	20	1373.057	184.183		
F3	Before warm up	20	2503.705	559.134	0.074	NS
	Self warm up	20	2347.243	620.380		
	Specific warm up	20	2666.279	427.782		
F4	Before warm up	20	3620.099	565.004	0.147	NS
	Self warm up	20	3583.307	382.371		
	Specific warm up	20	3837.806	301.397		

NS=NON SIGNIFICANT

To increase statistical sensitivity with a small number of individuals, the statistical analysis was designed to control for between - subject variability. There were comparisons made between each of the three circumstances at both pitch levels in order to investigate two major issues. Warm - up

conditions and pitch level have an impact. The effect of pitch level was not a topic of discussion. Changes in the environment were not of interest in this inquiry; in other words, it was not of interest to monitor changes in the environment. Measurements of acoustics as a function of pitch level. Rather, pitch level was an issue incorporated to increase the amount of strain (or "load") placed on each singer's voice (i. e., stressing the system) to improve the chances of success

The results fail to support the directional hypothesis that vocal warm - up has immediate effects on subsequent vocal quality in singing. The results of the study show the insignificance of changes in various acoustic parameters of voice with respect to different conditions that is without warmup, self warmup and specific warmups. This supports the previous studies that suggested the non - significance of vocal warmup exercises with respect to the parameters selected hence suggesting the dominance of preconception about the results of vocal warmups and its effects in singing.

**5. Discussion**

Warm - up exercises for the voice are thought to help reduce vocal fold injury in professional voice users. A frequent vocal warm - up is essential for professional singers and students of singing. The importance of a warm - up routine cannot be overstated.

The present study aimed at evaluating the effectiveness of vocal warmup with the help of acoustic parameters, Jitter, Shimmer, F1, F2, F3 and F4.

**Comparison of Different Conditions**

The results of comparison of different conditions proved to have no significance with respect to the acoustic parameters, selected for the study.

No significant differences were found between the various acoustic parameters used in different conditions, be it Jitter, Shimmer, F1, F2, F3 or F4.

When taking the study done by Helmbrecht in 1993 into consideration, the results show the equivalent insignificance of acoustic parameters in vocal warmups at different conditions.

**6. Summary and Conclusion**

According to the preceding summary of literature, it is essential to understand the variances of acoustic variables during vocal warmups at different conditions. As different conditions had different effects on the vocal folds, selection of vocal warmups are difficult and are not based on any scientific parameters. The vocal warmups used by different professional singers differ not based on the scientific aspects but based on the perceptual preconception about the quality of voice after the vocal warmup sessions.

The present study aimed at finding out the differences in acoustic parameters which are possible when compared as without, with self warmups, and using specific warmups.

The study was done in 20 different subjects; all of them has taken training in professional Carnatic music for at least a year.

The response was recorded with the help of a studio quality headphone with mic and was analyzed in PRAAT software. The obtained measure of Acoustic parameters was recorded and was analyzed statistically and was comparison was done.

The results showed insignificance of the data when undergone comparison and the initial hypothesis was proved wrong.

## 7. Limitations of the Study

- Limited sample size
- Restricted age range

## 8. Future Suggestions

- Addition of more number of participants for the continuation of the study might be helpful
- Addition of more parameters for assessment might be useful in the future studies.

## References

- [1] Amir, O., Amir, N., & Michaeli, O. (2005). Evaluating the influence of warmup on singing voice quality using acoustic measures. *Journal of Voice*, 19 (2), 252 - 260.
- [2] Asztalos, A. (2016). Importance of vocal warm - ups in children's choir rehearsals in Hungarian Music Primary Schools.
- [3] Boone, D. R., & McFarlane, S. C. (2000). *The voice and voice therapy*. Boston: Allyn and Bacon.
- [4] Gish, A., Kunduk, M., Sims, L., & McWhorter, A. J. (2012). Vocal warm - up practices and in vocalists: a pilot survey. *Journal of Voice*, 26 (1), e1 - e10.
- [5] Gunjawate, D. R. (2020). A Pilot Survey of Warm - Up Practices and Perceptions Among Indian Classical Singers. *Journal of Voice*, 34 (1), 156 - e15.
- [6] Gunjawate, D. R., Aithal, V. U., Guddattu, V., Kishore, A., & Bellur, R. (2016). Exploring attitudes of Indian classical singers toward seeking vocal health care. *Journal of Voice*, 30 (6), 761 - e23.
- [7] Helmbrecht, C. A. (1993). *Changes in vocal quality as a function of warm - up in trained singers* (Doctoral dissertation). Retrieved from <https://ttu - ir. tdl. org/ttu - ir/bitstream/handle/2346/60872/31295007650822>
- [8] Kim, J. (2015). Comparison of self - reporting voice evaluations between professional and non - professional voice users with voice disorders by severity and type. *Phonetics and Speech Sciences*, 7 (4), 67 - 76.
- [9] Karulkar, R. R., Ravi, R., & Gunjawate, D. R. (2020). Voice - related complaints and vocal and nonvocal habits of Hindustani classical singers: a questionnaire - based study. *Logopedics Phoniatrics Vocology*, 1 - 6.
- [10] Kaufman, T. J., & Johnson, T. S. (1991). An exemplary preventative voice program for educators, *Seminars in Speech and language*; 12, 40 - 48
- [11] Mayer, L. V. (1994). *Fundamentals of voice & diction*. Madison, Wis: WCB Brown & Benchmark
- [12] Moorcroft, L., & Kenny, D. T. (2012). Vocal warm - up produces acoustic change in singers' vibrato rate. *Journal of Voice*, 26 (5), 667 - e13.
- [13] Ofer, A., Noam, A., & Orit, M. (2005). Evaluating the Influence of Warmup on Singing Voice Quality Using Acoustic Measures *Journal of Voice*; 19 (2), 252 - 260
- [14] *Professional and occupational voice users*. Professional and Occupational Voice Users Michigan Medicine. (n. d.). Retrieved September 24, 2021, from <https://www.uofmhealth. org>
- [15] Radionoff, S. L. (2004). Preparing the singing voice specialist revisited. *Journal of voice*, 18 (4), 513 - 521.
- [16] Ribeiro, V. V., Frigo, L. F., Bastilha, G. R., & Cielo, C. A. (2016). Vocal warm - up and cool - down: systematic review. *Revista CEFAC*, 18, 1456 - 1465.
- [17] Sataloff RT. Professional voice users: the evaluation of voice disorders. *Occup Med*. 2001 Oct - Dec; 16 (4): 633 - 47, v. PMID: 11567923.
- [18] Stemple, L. C. (1995). *Clinical voice pathology Theory and management*, Mosby year Book Inc. Mo. USA 155 - 171.
- [19] Nelson Roy, Ray M. Merrill, Susan Thibeault, Rahul A. Parsa, Steven D. Gray and Elaine M. Smith (2004). Prevalence of Voice Disorders in Teachers and the General Population. [https://doi. org/10.1044/1092 - 4388 \(2004/023\)](https://doi. org/10.1044/1092 - 4388 (2004/023))

## Appendix -I

### Consent Form

I hereby give my consent for my participation in the project entitled: "VOCAL WARMUPS AND ITS EFFECTIVENESS IN SINGERS." I understand that the person responsible for this project is: JOHN O PIOUS, under the guidance of Dr SATISH KUMARASWAMY.

He has explained that these studies are part of a project that has the following objective: to gather voice recordings of sung productions of the vowel /a/ on three separate occasions. He has explained the procedures to be followed and has described benefits to be expected.

It has been explained to me that there are no risks involved in participation of this experiment. It has further been explained to me that the total duration of my participation will be less than 10 minutes for three occasions. Only JOHN O PIOUS will have access to the data collected for this study; and that all data associated with this study will remain strictly confidential. JOHN O PIOUS, under the guidance of Dr SATISH KUMARASWAMY, has agreed to answer any inquiries that I may have concerning the procedures.

I understand that I may discontinue this study at any time I choose without penalty.

Signature of Subject: \_\_\_\_\_ Date: \_\_\_\_\_  
Signature of Project Investigator: \_\_\_\_\_ Date: \_\_\_\_\_