

EFFECTS OF INTEGRATED YOGA ON MAXIMUM PHONATION AND PITCH IN A MUSIC TEACHER: A SINGLE-CASE STUDY

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Abstract

This study explores the impact of an Integrated Yoga module on vocal health and performance in a 52-year-old music teacher, emphasizing key physiological parameters—Maximum Phonation Duration (MPD), Average Voice Frequency (AVF), Resting Pulse Rate (RPR), and Resting Respiratory Rate (RRR). The voice, much like a musical instrument, is shaped by anatomical and physiological factors, and disorders can be either organic or functional. While organic issues require medical treatment, functional voice issues can benefit from training, such as through yoga. The module combined breathing exercises, asanas, pranayama, and Nadanusandana to enhance vocal control, resonance, and endurance. The intervention, performed daily for one month, demonstrated significant improvements in MPD (18.75% increase), AVF (7.22% increase), and RPR (8.11% decrease), while RRR remained unchanged. These findings suggest that yoga practices enhance vocal stamina, resonance, and relaxation, ultimately improving overall vocal health. The study underscores the potential of integrative voice training techniques, such as those found in yoga, to address functional voice disorders by promoting better breath control, muscle flexibility, and alignment, which are essential for producing a clear, stable, and powerful voice. These results contribute to a holistic approach to voice care, offering a non-invasive method to improve vocal performance and endurance. A paired t-test revealed significant improvements in vocal health, with MPD increasing by 18.75%, AVF rising by 7.22%, and RPR decreasing by 8.11%, while RRR remained unchanged, indicating enhanced vocal control, resonance, and relaxation.

Keywords: Integrated Yoga, Phonation, Pitch, Music Teacher, Case Study

INTRODUCTION

The human voice, similar to a musical instrument, has features like warmth, modulation, elasticity, adjustable resonators, and articulation. The quality of voice production in both speaking and singing is influenced by anatomical and physiological factors. Key structures for voice production include actuators, vibrators, and resonators, which work together to convert energy into sound and enrich its quality.^[1] Voice defects can be organic or functional. Organic issues, such as nodules and polyps, require medical treatment, while functional disorders can be improved with voice training.^[2] A comprehensive Yoga module for voice training enhances breathing, strengthens the voice, and improves overall health.

In the *Natyashastra*, *Bharatmuni* defines the six qualities of an ideal voice as follows: *Shravaka* (audible from a distance), *Ghana* (strong and pleasing), *Snigdha* (smooth and firm), *Madhura* (melodious), *Avadhanavana* (balanced), and *Tristanashobi* (capable across three octaves).^[4]

In *Sangeetaratnakara*, *Sharangadeva* identifies eight voice flaws, including dry quality, breakage, hollowness, hoarseness, lack of sweetness, difficulty in sound production, weak tonality, and grunting.^[5] These align with modern voice disorders such as hoarseness and nasality, which are often treated with yogic practices to improve resonance and vocal stability through controlled breathwork and tone placement.

Physiological parameters like Maximum Phonation Duration (MPD), Average Voice Frequency (AVF), Resting Pulse Rate (RPR), and Resting Respiratory Rate (RRR) are vital for promoting vocal health and efficiency, which are essential for effective voice production.^[6-9] These factors support a clear, stable, and powerful vocal performance, crucial for sustained vocal quality and endurance. Maximum Phonation Duration (MPD) is the longest time a person can sustain a vowel sound on a single breath.^[10] Average Voice Frequency (AVF) is the average fundamental frequency of a person's voice during speech.^[11] Resting Pulse Rate (RPR)

is the number of heart beats per minute while at rest. ^[12] Resting Respiratory Rate (RRR) is the number of breaths a person takes per minute while at rest. ^[13]

CASE STUDY

In a case study of a 52-year-old female music teacher, an Integrated Yoga module incorporating Breathing Practices, *Asana*, *Pranayama*, and *Nadanusandana* was applied. The study observed effects on her maximum phonation duration (MPD), average voice frequency (AVF), resting pulse rate (RPR), and resting respiratory rate (RRR).

MATERIALS AND METHODS

The participant followed a 45-minute Integrated *Yoga* module each morning (Monday–Friday) from 7:00 to 7:45 am for one month. MPD was assessed using a stopwatch during a sustained “a” vowel in a seated position, and AVF was measured with the Voice Pitch Analyzer (version 1.3.0, Purr Programming). RRR and RPR were recorded using a stopwatch to count breaths and pulse per minute, respectively. Data collection occurred before and after the intervention.

INTERVENTION

Integrated Yoga Practices for Enhanced Vocal Health and Performance

SN	Particulars	Duration
1	Opening Prayer (Sahana vavathu) at the start of the session	1 mins
2	Introduction to Breathing practices such as: Hands Stretch breathing Hands In and Out Breathing Ankle Stretch breathing Sectional and full yogic breathing (3 rounds each breathing practice)	10 mins
3	Loosening practices from head to toe (Preparatory practice for Asanas)	5 mins
4	Introduction to Ujjayi Pranayama (Progressive learning on the part of the participants)	10 mins
5	Asanas – Ushtrasana, Bhujangasana and Vakrasana (to sensitize the throat region) – 2 min each	6 mins
6.	Nadanusandana	3 minutes
7	Deep Relaxation techniques (Conscious Relaxation of all parts of the body) + Closing prayer (Sarve bhavantu sukhinaha)	10 minutes

STATISTICAL METHOD

A paired t-test was utilized to evaluate the significance of the changes observed.

RESULTS

The physiological parameters, including Maximum Phonation Duration (MPD), Average Voice Frequency (AVF), Resting Pulse Rate (RPR), and Resting Respiratory Rate (RRR), play a crucial role in enhancing vocal health and efficiency, which are essential for effective voice production. A paired t-test revealed significant improvements, with MPD increasing from 16 to 19 seconds (18.75% increase, $p < 0.05$), indicating better vocal control and stamina; AVF increasing from 194 Hz to 208 Hz (7.22% increase, $p < 0.05$), suggesting a brighter, more resonant voice quality; and RPR decreasing from 74 to 68 beats per minute (8.11% decrease, $p < 0.05$), reflecting improved relaxation and potentially better cardiovascular health, while RRR remained unchanged

at 12 breaths per minute ($p>0.05$), indicating consistent respiratory health. Figure 1 is the graphical representation of the results (pre-post scores).

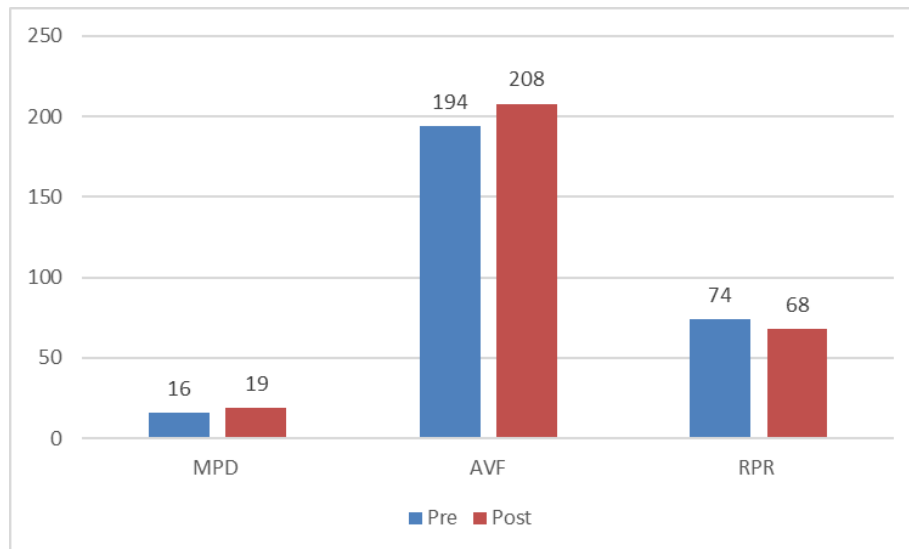


Figure 1: Pre and Post scores of MPD, AVF, and RPR

DISCUSSIONS

The results suggest that the Yoga module can significantly enhance vocal health and efficiency, leading to a more powerful and resonant voice. This improvement can be attributed to the following practices and their mechanisms. Hands Stretch Breathing, Hands in and out Breathing, and Ankle Stretch Breathing improve lung function, flexibility, and joint mobility, thus increasing vital capacity. These exercises synchronize breath with movement to enhance lung expansion, respiratory muscle function, and circulation.^[14] Full yogic breathing, also known as diaphragmatic breathing, enhances breath control and vital capacity, supporting clearer and more stable vocal sounds.^[15-17] These benefits are supported by research on yogic practices and their impact on respiratory functions.^[18] *Ujjayi Pranayama* involves deep, controlled inhalation and exhalation through the nose with a slight throat constriction, producing a sound reminiscent of ocean waves. This technique enhances oxygenation, activates the parasympathetic nervous system for relaxation, improves lung capacity, encourages mindfulness, and promotes better vocal health by reducing tension in the vocal apparatus.^[19-21] Back-bending yoga postures like *Bhujangasana* and *Ushtrasana* enhance postural mechanics and overall health, including voice production.^[22] *Bhujangasana* and other yogic poses improve respiratory and vocal functions,^[23] while asanas like *Vakrasana* and *Ushtrasana* relieve stress and boost health, positively impacting voice production.^[24] Sound production uses the larynx and palate as resonators. *Om (Aum)* is the foundational sound, with A pronounced without tongue or palate contact, M with closed lips, and U rolling from the root to the mouth's end, representing the full sound spectrum (25). *Nadanusandhana*, involving A, U, M kara, and Om kara chanting, enhances vocal quality and control by emphasizing sound resonance within the body and focusing on "Anahata Nada" (the unstruck sound), promoting inner peace and clarity.^[25]

CONCLUSION

The Integrated *Yoga* module contributes to a holistic approach to voice training by improving the physiological parameters critical for effective voice production and overall vocal performance. This module includes practices like breathing exercises, yogic postures, and *Nadanusandhana*, which enhance lung function, breath control, and vocal quality, while also promoting relaxation and overall health. These combined benefits lead to a more powerful, resonant voice and better vocal endurance.

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