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A METHODOLOGICAL FRAMEWORK FOR VOCAL RESONANCE TRAINING: INTEGRATING PHARYNGEAL VOICE PEDAGOGY AND MODERN ACOUSTICS

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Abstract:

Vocal resonance is the fundamental aspect of the quality of singing, projection, and richness of expression, but current training methods are still disjointed. Pedagogical approaches, e.g., the Eight Steps of Pharyngeal Voice Training offered by Lin Junqing, are valuable and practical, yet they are not always put into a systematic setup in an academic approach. Modern acoustic research, on the other hand, provides more elaborate explanations of resonance phenomena, such as formant tuning, singer formant and resonance tube phonation, but these results have not been applied to vocal pedagogy. This paper suggests a conceptual framework for vocal resonance training combining the traditional theoretical pharyngeal voice training with the modern theory of acoustics. The framework is conceptually a ten-step framework based on the literature synthesis and pedagogic analysis of the eight-step model presented by Lin, with each step characterised by its pedagogical goal, physiological process, anticipated outcome and scholarly support. This paper indicates that the suggested framework will help develop a more systematic perspective on resonance pedagogy and its applicability to performing arts research.

Keyword:

Vocal Resonance, Pharyngeal Voice, Vocal Acoustics

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Introduction

Vocal resonance is widely regarded as a fundamental aspect of the quality, projection, and expressiveness of a singing voice. Resonance is also an essential element of vocal technique along with breathing, phonation, and articulation. As breathing supplies the source of energy and phonation supplies the main tone, the resonance plays the role of how this tone is increased, coloured and heard by the listener. Even technically correct phonation cannot be brilliant, projected, and communicative without good resonance adjustment. It is due to this that resonance has become a key subject of vocal pedagogy as well as voice science.

Traditional vocal schools have, in the past, made a great contribution to the teaching of resonance. The bel canto style in the Western classical tradition focused on the positioning of the voice to create a balance between brightness and warmth, with the help of intuitive images and drills. Lin Junqing (1982, 2019), in his book in China, suggested a systematic system in the modification of resonance, especially the importance of the pharyngeal cavity in strengthening the overtones. The similarity between these pedagogical methods is that they are all aimed at the task of converting the uncultured sound at the vocal folds into a vibrant, musical quality of singing. However, these traditional approaches often remain within the domain of experiential pedagogy and lack systematic academic framing and empirical integration with modern voice science.

Contemporary voice science could further evolve alongside the educational traditions where much progress has been made in the understanding of the acoustics and physiology of resonance. Singers are selectively tuning the formants in their larynx to correspond better with the harmonic frequencies: formant tuning has been found to be one of the reasons why singers can project better (Sundberg et al., 2013). The phenomenon of the singer's formant, which is an accumulation in the spectrum at 2.5-3 kHz, has been shown to play a role in the transmission power of operatic voices (Titze 2022). In addition, some techniques (e.g., resonance tube phonation) have been researched for their pedagogic and therapeutic value, with measurable improvements in efficiency and timbre as a result (Enflo et al., 2013). These findings have contributed to a scientific understanding of resonance, but it is generally detached from the learning process.

The boundary between traditional pedagogical methods and modern acoustic practices introduces complexities for both theoretical interests and methodologies. On the one hand, traditional approaches provide an enormous wealth of practical knowledge accumulated over the centuries in which the teaching and performing have been practised. On the other hand, the acoustic research provides exact physiological and spectral answers to the phenomena of resonance. Yet few studies attempt to combine these two perspectives into a comprehensive methodological framework that will be useful for both performers and scholars. Therefore, the field will still be at risk of getting caught in a dilemma of choosing between experiential

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pedagogy and scientific enquiry, which will hinder the opportunities of interdisciplinary development.

This gap is the reason why the present research aims to fill it with a methodological approach to vocal resonance optimization that merges pharyngeal voice training and current acoustic knowledge. It modifies the ten-step model of the pharyngeal voice training by Lin Junqing into a broader eight-step approach but places all ten steps in the framework of current acoustical studies. It is the integration that offers a systematic way of teaching and situates the methodology within a wider scholarly framework of the study of vocal science and performing arts.

The objectives of this research are threefold. First, the manuscript attempts to clarify the physiological and acoustical processes that make up traditional resonance exercises to redefine them as empirically based strategies and not purely experiential instructions. It follows this with a systematically ordered ten-step schema that can be subjected to a pedagogical application as well as academic analysis of resonance. It eventually highlights the scholarly and interdisciplinary relevance of resonance training through the examples of its applicability to other fields like music performance science, psychoacoustics, and speech therapy.

The benefit of the study is its methodological orientation. Offering a well-developed structure that will allow the collision of traditional pedagogy and contemporary acoustics, it not only enhances vocal pedagogy but will also help to promote the academic knowledge of resonance as a multidimensional phenomenon. In the case of the performing arts discipline, this research paper has shown that conceptual pedagogical frameworks could produce high-quality frameworks which have pedagogical applications as well as academic importance.

Literature Review

Traditional Vocal Pedagogy

The development of training in vocal resonance has been influenced, in large part, by vocal pedagogy traditions in Western and Chinese contexts. Within Western classical singing, the resonance traditions of the bel canto school viewed vocal resonance as the primary means to attain the desirable combination of brilliance and warmth. “Placing the voice” was a common technique, where the instructor and the singer would converse in a manner where the singer was expected to place and project the voice, so the sound was rich. While effective, a large part of the instructions and observations of the method skipped the scientific explanation and focused on metaphor. Sundberg (1987) acknowledges this “power” in pedagogy but explains the lack of adjustment description in the vocal tract. Miller (2008) points out further that the science of resonance in singing was, and still is, partly a neglected art, leaving systematic explanation wanting. Most recently, Sadolin (2021) attempts to provide comprehensive codification of disparate techniques. However, the primary material remains practice orientated.

In China, the works of Lin Junqing (1982, 2019) significantly integrated pharyngeal voice training (*yàn yīn*) into the development of resonance. In particular, Lin’s Eight Steps of Pharyngeal Voice Training outlined a set of exercises intended to unlock the throat, increase the pharyngeal cavity, and fine-tune the resonance of the voice. There are attempts to codify pre-existing traditional pedagogy into systemised stages. But while Lin’s influence permeated

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the teaching of voice in China, it remained within the boundaries of pedagogy and did not engage acoustics.

Traditionally, the pedagogy of voice teaching and learning has posed rich experiential material for resonance. But the absence of scholarly treatment has come from the predominance of imagery and abstract instructional methods. Therefore, we must frame traditional exercises within a robust scientific and cross-disciplinary paradigm.

Modern Vocal Acoustics

As pedagogy continues to evolve, contemporary voice science has provided detailed understanding of the intricacies of vocal resonance. Studies on formant tuning have shown how singers shaped the vocal tract to bring the formants into alignment with harmonic frequencies, thus increasing the singer's voice. Sundberg et al. (2013) showed that professional singers shift vowel formants, and thus the singer's voice, to maximise resonance, while Titze (2022) explained the acoustic principles underlying the tuning. The works cited above demonstrate that resonance and the resonance pedagogy explained can be understood as an acoustic phenomenon that can be measured.

Another major contribution modern voice science has made is the work done on the singer's formant. It's defined as the clustering of frequencies between 2.5 and 3 kHz, which helps the voice to carry during performances. Ambros and Andrada e Silva (2025) examined this phenomenon in professional tenors and emphasised the projection-sustaining resonance strategies employed during performances. Likewise, Lee et al. (2008) investigated the acoustic and perceptual dimensions of operatic "ring" and underscored the importance of professional singing formant clustering in operatic singing.

Resonance tube phonation has had a profound impact on the understanding of resonance training. Enflo et al. (2013) examined semi-occluded vocal tract exercises and the impact on phonation threshold pressure and vocal fold collision during the time of study. Somanath and Ma (2016) supported this work in voice rehabilitation and voice training and pointed out the value of resonance tube exercises in therapy. The impact of their work supports the concept of resonance tube phonation in the enhancement of efficiency and timbre, along with a clinical and pedagogical approach.

Modern acoustic research brings forth the primary use of empirical research in resonance and the use of spectrographic and physiological models. Though this is the case, this research is mainly disconnected from the practical use of vocal pedagogy, and for this reason, the impact of this work on training singers is minimal.

Interdisciplinary Perspectives

The exploration of resonance goes far beyond pedagogy and acoustics. It can also take on perspectives from psychology, the performing arts, and speech therapy. The psychology of music provides some understanding of how singers experience resonance and tone colour. Raveendran and Krishna (2025) state that for instance, studied the auditory-perceptual assessments of resonance with professional singers, demonstrating the impact of perception on performance decisions. Ternström (2023) studied the acoustic measures of voice quality and

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emphasised the perceptual correlates of resonance in the assessment of vocal timbre within the context of older literature and research.

Within resonance studies from the performing arts perspective, the most common understanding of resonance focuses on the concept of embodied performance practice. Welch (2016) state that singing teaching should combine pedagogy with the art of embodiment, thus aligning scientific integration with artistic performance. In the same way, Callaghan (2014) focuses on the connection between the body, brain, and voice, the phenomenon of resonance as both physiological and performative.

The literature has covered resonance training in the context of speech therapy and voice care. Rosenberg and LeBorgne (2019) discuss the role resonance strategies can play in safeguarding the vocal health of professional "vocal athletes". Davids and LaTour (2021) discuss the formation of healthy vocal habits, stressing that resonance exercises are key to avoiding vocal strain and fatigue. These descriptions show that the role of resonance is not limited to the performance context and also serves voice rehabilitation and voice maintenance.

From different fields, the role of resonance in perception, performance, and vocal health attests to its cross-disciplinary nature. These disparate insights, while important, do not cohere to form a unified pedagogical or methodological approach, indicating the need for synthesis.

Synthesis and Research Gap

The reviewed literature highlights three fundamental gaps. First, traditional pedagogy is lacking a systematic academic framing, and although practice pedagogy contains plenty of good insights, it is still a classic case of 'contextualising the science after the practice'. Exercises such as Lin's Eight Steps remain pedagogically effective but scientifically contextualised. Second, modern acoustics certainly offers precise empirical explanations but almost never offers insights as to how these could be converted into pedagogically framed training for singers. Third, interdisciplinary research, while certainly valuable for the most part regarding perception, performance, and health, tends to avoid dealing with pedagogy.

This study aims to address these gaps by developing a ten-step methodological framework for vocal resonance training. The framework integrates classical pedagogy with contemporary acoustics by broadening Lin Junqing's Eight Steps into a ten-step model and contextualising each stage within contemporary voice science. Additionally, by focusing on its relevance to cross-disciplinary scholarship, the study serves vocal pedagogy and the scholarship on the performing arts more generally.

Methodology

Nature of the Study

This study is a conceptual and methodological paper based on literature synthesis and pedagogical analysis. It does not involve empirical experimentation, human participants, or acoustic measurements. This study is aimed at proposing a theoretical model of vocal resonance training based on the developed unification of the traditional pharyngeal voice training with the recent acoustic theories. All the results mentioned in this paper, therefore, must be taken as conjectural pedagogical suggestions and not empirically tested findings.

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Data Sources

Three classes of such data sources were used to construct the framework:

Classical Pedagogical Literature

The Eight Steps of Pharyngeal Voice Training (2019) by Lin Junqing are the foundation for this book. These works contain a system of exercises for the opening of the throat, expansion of the pharynx, and resonance regulation. These works are some of the most systematic attempts to describe Chinese vocal pedagogy in a formal way and are thus important for formulating an organized approach.

Modern Acoustic Research

A second source of information was empirical research in the area of vocal acoustics. These include studies of formant tuning (Sundberg et al., 2013), the singer's formant (Ambros & Andrada e Silva, 2025), and resonance tube phonation (Somanath & Ma, 2016). Scientific basis is given by a range of sources so that each exercise can be put into context in voice science today.

Interdisciplinary Perspectives

Finally, transdisciplinary scholarship was included for the purpose of enhancing the applicability of the framework. Resonance training and its perceptual, physiological and aesthetic dimensions are interrelated, and their connection is clearly illustrated in music psychology (Raveendran & Krishna, 2025), voice health and therapy, and performing arts studies. By this means, the sources provide a further, non-pedagogical application for the framework, placing it in the wider corpus of performance studies scholarship.

Together, these sources became the pedagogical framework, provided empirical support, and highlighted the interdisciplinary relevance that was necessary to develop the ten-step methodological framework.

Research Procedure

The methodological process was carried out in four steps:
1. Literature Collection: A collection of literature was made, including Chinese pedagogy manuals, Western voice pedagogy literature, modern acoustic research, and interdisciplinary research.
2. Extraction of Pedagogical Principles – Lin's Eight Steps were dissected, and the key principles of throat opening, resonance tube formation, and vowel calibration were highlighted.
3. A comparative study was made based on the modern acoustic theory and compared systematically with Titze's models of the vocal tract acoustics and Sundberg's work on formant tuning.
4. Framework Development – The original eight-step model was developed into a ten-step framework. Each step was defined with regard to (a) target or aim, (b) physiological mechanism, (c) expected outcome, and (d) supporting scholarly references.

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During this development process, the framework was not a reorganisation of pedagogical exercise, but a scientific model based on tradition and current scientific research.

Limitations

A number of limitations need to be mentioned. First, the study is not directly empirically validated, for example, using spectrographic measurements or perceptual evaluations. Although the framework is conceptually sound, further research is necessary to validate its acoustic results using systematic experimental means. Second, the framework has been developed mostly in the classical and pedagogical settings. Its usefulness for other genres—such as popular music and musical theatre—remains untested empirically. Finally, despite the integration of interdisciplinary literature, the framework has not been tested in clinical or therapeutic settings, where resonance training might offer added value.

Ethical Considerations

This study did not involve human participants, workshops, experimental trials, or data collection. The framework was only created based on literature synthesis and pedagogic rationale. Therefore, ethical approval and informed consent were not required. Subsequent empirical research that uses this framework will aim for institutional ethical approval and informed consent among the participants, where applicable.

Summary

The methodology used in this study is a combination of tradition and science. By referencing pedagogical, acoustic, and interdisciplinary sources as well as converting existing training practices into a ten-step framework, the research serves resonance training as a practicable tool as well as an academic model. While not ideal, the methodological approach highlights how theoretical and pedagogical frameworks can contribute to knowledge development within the performing arts field.

Findings: A Ten-Step Framework for Optimizing Vocal Resonance

This paper presents a ten-step method, which structures a systematic approach that combines traditional laryngeal voice training methods with modern acoustic theory. Table 1 describes the framework, and the subsequent sections explain the components in detail.

Table 1: Ten-Step Framework for Optimizing Vocal Resonance

Step	Target / Aim	Vocal Mechanism	Expected Outcome
1. Correct Throat and Mouth Openings	Establish relaxed pharyngeal cavity and jaw	Jaw relaxation, pharyngeal expansion, laryngeal positioning	Reduced jaw tension improves overtone resonance
2. Diaphragmatic Breath Control	Strengthen breath support and diaphragm control	Diaphragm–abdominal antagonism, costal breathing	Stable airflow, endurance for singing

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3. Jaw Relaxation	Prevent constriction during phonation	Suprahyoid muscle release, chin relaxation	Freer phonation reduces tension
4. Tongue Groove Formation	Optimize airflow direction and resonance	Longitudinal tongue groove, hyoid bone elevation	Clearer resonance, stable vowel shaping
5. Wide-Mouth Phonation	Amplify overtone series	Pharyngeal tube formation, triangular mouth shape	Stronger, high-frequency resonance, projection
6. Humming Resonance Exercise	Encourage forward placement and nasal resonance	Soft palate elevation, nasal airflow management	Bright, focused tone, efficient projection
7. Small-Mouth Resonance Transition	Transition from nasal to oral resonance	Zygomatic muscle lift, laryngeal lowering	Balanced timbre, smoother vowel transitions
8. Pitch and Vowel Calibration	Maintain resonance alignment across pitch	Formant tuning, vowel modifications	Balanced timbre across vowels and registers
9. Pharyngeal “U” Exercise	Strengthen resonance tube function	Fundamental tone tube + overtone tube	Fuller, brighter, penetrating sound
10. Open-Throat Resonance Integration	Integration of resonance cavities: control of timbre	Laryngeal lowering, pharyngeal expansion	Darker, rounder timbre; expressive flexibility

Step 1. Correct Throat and Mouth Opening

Basically, the first step of the framework is to relax as much as possible the pharyngeal cavity and the jaw. This allows for the expansion of the vocal tract and allows it to act as a resonating chamber of elevated acoustic quality. The key anatomical materials are jaw relaxation, pharyngeal space expansion, and laryngeal stabilisation. These actions are used to reduce unnecessary muscle tension from the jaw and pharynx that would otherwise interfere with the process of phonating.

In proper vocal technique, the proper opening up of the pharyngeal region results in the enhancement of the higher harmonic partials, and the timbre of the voice becomes brighter and richer. Lin (2019) notes that throat opening is one of the most important embodiments in pharyngeal training, a door to the control of resonance. Likewise, Dimon (2018) says that from the anatomical side, the pharyngeal cavity is a resonant booster, and its stretching directly increases the vocal clarity.

Step 2. Diaphragmatic Breath Control (“Puppy Panting”)

The second step increases breath support through engaging the diaphragmatic control. The method, which is sometimes called "puppy panting," teaches the singers how to coordinate their diaphragm and abdominal muscles during bursts of inhalation and exhalation. This practice is focused on the antagonistic relationship between the diaphragm and abdominal wall while keeping the costal part expanded.

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This is useful in making the airflow become more stable and also increasing stamina needed in longer singing phrases. Through greater efficiency of respiration, singers are able to hold the resonance even in long vocal lines. Watson & Hixon (1985) confirm this important role of the diaphragm engagement in professional voice use, showing that respiratory support is directly related to resonance stability.

Step 3. Jaw Relaxation

The third step is concerned with relaxing the jaw so that it doesn't constrict during phonation. Overactivity of the suprahyoid muscles can induce tension and diminish resonance. Deliberate awareness and consequent relaxation of this musculature enable singers to reach a state of vocal subsidence and enable more uniform vibration of the vocal folds.

Sundberg (1987) stresses that the relaxation of the jaw is absolutely fundamental to opening up to a natural singing voice. From the pedagogical and scientific perspective, this measure guarantees that resonance is not obstructed by unnecessary muscular tension so that the flow of acoustic energy is improved.

Step 4. Tongue Groove Formation

Formation of the tongue grooves is done by shaping the tongue longitudinally and lifting the hyoid bone at the same time. It is a structural process that guides airflow in a more accurate way, makes the articulation of vowels more stable and enhances the clarity of resonance.

Titze (2022) suggests that tongue shaping is directly linked to acoustic formant alignment, and it plays a major role in determining the acoustic intelligibility and resonance of vowels. The step consequently connects phonetic stability and resonance efficiency and further justifies the combination of physiology and acoustics in the training of the voice.

Step 5. Wide-Mouth Phonation

This stage highlights wide-mouth phonation that is realised by the triangularing of the mouth and broadening of the pharyngeal tube. Such alterations enhance the high-frequency overtones, resulting in a brighter sound projection.

The above procedure is a classical method of pharyngeal voice training in Chinese teaching (Lin, 1993), whereas Henrich, d'Alessandro, & Doval (2001) present acoustic data to confirm that the vocal tract configuration has a direct influence on the network of resonance. Taken together, the above observations provide a basis for assigning a function to wide-mouth phonation in the optimisation of resonance and projection.

Step 6. Humming Resonance Exercise

Humming is used to promote forward resonance placement and form nasal resonance. The mechanism entails raising the soft palate and the management of the nasal airflow to impart a bright and focused tone. Such practice increases projection via equalising oral and nasal articulatory input.

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Sundberg et al., (2013) substantiated the importance of humming in resonance tuning methods, but Howard and Murphy (2008) examined the effectiveness of using humming in the instructional setting to assess and correct resonance imbalance. This step, therefore, is a useful warm-up method as well as an exercise that is based on acoustics.

Step 7. Small-Mouth Resonance Transition

Small-mouth resonance transition This concerns the smooth transition of resonance between the nasal and oral cavities. Physiologically, it involves lifting of the zygomatic muscles and slightly dropping of the larynx to put resonance in place.

According to Zhang (2016), these types of transitional methods enhance the timbral stability of vowels, whereas resonance tube modifications are important in professional vocal timbre, as Ambros and Andrada e Silva (2025) show. The experiment can be used as a demonstrative example of how close anatomic changes can lead to the quantifiable acoustic outcomes.

Step 8. Pitch and Vowel Calibration

The pitch and vowel calibration are done in such a way that resonance alignment is consistent throughout the vocal range. Singing eliminates tonal imbalance and resonance stability by utilising formants and adjusting vowel shapes.

Miller (2008) focuses on the fact that vowel modification is an absolute requirement of consistent resonance in professional voice, whereas Ternström (2023) concentrate on its quantifiable outcomes in the acoustic quality. This action highlights the significance of the presence of vocal acoustics and pedagogy in sustaining resonance in registers.

Step 9. Pharyngeal "U" Exercise

The ninth step aims at resonance strengthening, which involves the alignment of the basic tone tube in the lower pharynx with the overtone tube in the upper tract. It is a combined resonant system that produces a richer, brighter and more penetrating voice timbre.

Titze (2022) perceives pharyngeal resonance as a key to effective voice production, whereas Echternach et al. (2024) provide biomechanical data on the positive effect of pharyngeal manipulations in creating the high-pitch sound. Such practice shows the collaboration of tradition and modern science.

Step 10. Open-Throat Resonance Integration

The last step incorporates several resonance cavities through the lowering of the larynx and widening of the pharynx. The outcome of such a timbre is an increase in expressive capability, a darker timbre, and a more rounded timbre.

According to Dimon (2018), open-throat singing is the technique with the highest potential of resonance, whereas Sundberg (1987) makes it a pillar of classical vocal training. Such a combination creates the aesthetic richness as well as strengthens sustainable vocal practice.

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Summary of Findings

The ten-step framework is a resonance optimisation methodology that incorporates both the principles of pedagogic tradition and acoustic science. Each of the steps is used to produce a more resonant, projected and richer timbre. Collectively, they are useful in exposing a role that practical exercises, founded on an anatomy of knowledge and a theory of sound, might have in offering a methodological framework of vocal performance and academic study.

Discussion

This work presents a ten-step methodological framework that systematically optimises vocal resonance by integrating traditional pharynx voice training methods with recent acoustic studies. This section explains the ways in which the framework fits into the existing body of scholarship and its relevance in the research of performing arts, as well as ways it can be applied in pedagogical and interdisciplinary practices.

The Correlation with Contemporary Acoustics Research Is Discussed

There are several points of the ten-step model that agree with recent findings in the discipline of vocal acoustics. As an example, the tongue groove-making (Step 4) is directly analogous to the case of tongue shaping and hyoid elevation as observed by Titze (2022), who found a considerable impact of tongue shaping and hyoid elevation on the vocal tract acoustics and formant alignment. In the same way, the small-mouth resonance transition (Step 7) corresponds to the variations that Ambros and Andrada e Silva (2025) investigated, who showed that slight changes in resonance tube length affect the formant tuning of the singer with professional tenors.

The framework also satisfies the significance of formant tuning and vowel calibration (Step 8), as demonstrated in the study by Sundberg et al. (2013) on synthetic vowel adjustment to resonance alignment. Besides that, the pharyngeal U exercise (Step 9) and open-throat integration (Step 10) are also consistent with Echternach et al. (2024), who also demonstrate the biomechanical importance of pharyngeal manipulations in high-pitched singing. All these alignments testify to the fact that not only pedagogically but also acoustically, the framework is sound.

The Framework Makes A Significant Contribution To The Field Of Arts In The Performing Arts

In addition to acoustics, the framework also offers contributions to the area of performing arts since it applies experiential exercises to a systematic approach. Traditional pedagogical models, e.g., the Eight Steps by Lin (2019), were originally written as a manual of teaching. This research takes them a step further to an informed protocol of research by framing them in a methodological and academic framework. This approach is in line with the appeal of Welch (2016), who propose using pedagogical methods that combine scientific knowledge with artistic enactment.

Furthermore, the paradigm fills the gap between pedagogy and performance studies because the concept of resonance is imagined through both physiological and performative processes. The humming resonance (Step 6) and jaw relaxation (Step 3) exercises are not offered as an

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act of pure technique anymore but as a voice science practice related in some way to other artistic results. This framework highlights the importance of such studies for the development of the scholarship of performing arts.

Pedagogical Implications and Practical Implications

Pedagogical perspective the framework offers a gradual training process, which is modifiable to different learners. This is done by starting with fairly simple physiological activities, such as opening and closing the throat and diaphragmatic breathing in Steps 1 and 2, which eventually evolve into the more encompassing throat-opening technique in Step 10. This order makes it possible to learn gradually and, at the same time, to ensure scientific consistency.

For practitioners, the framework provides a means of formalising the teaching methods and lessening the use of metaphorical imagery, which has always prevailed in the vocal pedagogy of the historical past. The framework is based on pedagogy and acoustics, making it clearer to students and giving them measurable outcomes. The resonance training is also essential in preserving vocal health, as Rosenberg and LeBorgne (2019) mention, which makes the framework applicable to both the performance improvement and the prevention of vocal strain.

Limitations and Future Projections

In spite of the contributions, there are several limitations accepted in this study. First, the framework is literature-based and has not been empirically validated using acoustic measurement like spectrographic analysis. Although it is not a negative aspect of its pedagogical worth, the possibility of including acoustic data should be taken into account in future studies to determine the results of every step in quantitative terms. As emphasised by Lã and Fiuza (2022), real-time feedback technologies can provide useful tools for achieving this goal.

Second, the framework is now revolving around classical and pedagogical settings. We have yet to test its generalisability to other genres, such as popular music or musical theatre. Since the set of demands for styles varies in the traditions, further study or research might adapt and test the framework for various vocal practices.

Lastly, the framework can be interdisciplinarily used to a significant extent. Resonance strategies have already been used in speech therapy (Somanath & Ma, 2016), music psychology and voice health research. Application of the framework in these areas may widen its scope to more areas beyond performance and make it a model of interdisciplinary cooperation.

Conclusion

The proposed study aims to optimise vocal resonance by combining traditional pharyngeal voice training practices with modern acoustic theory. Based on the Eight Steps of Pharyngeal Voice Training (2019) by Lin Junqing and the latest research on formant tuning, singer's formant, and resonance tube phonation, the original framework of the eight steps has been conceptually developed into a ten-step model. The steps are outlined with a focus on pedagogical purpose, physiological mechanisms, anticipated acoustic results, and academic justifications to ensure that hands-on activities are redesigned into a well-structured academic framework.

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The results point out that resonance training is not only a matter of pedagogical tradition but also an object of scientific research. By recontextualising traditional methods in the language of voice science, this study shows how the knowledge built through practice can be established as methodological knowledge. By doing so, it contributes to the science of vocal pedagogy by offering a systematic approach that informs itself using a set of literature in an attempt to minimise the use of metaphorical teaching and provide better pedagogical guidelines.

The implications of the pedagogy framework extend beyond just pedagogy in performing arts research. It is an example of how practice-informed conceptual research can produce academically rigorous research results with a bridge between the experiential field of vocal performance and the theoretical insights of acoustics and interdisciplinary research. By doing so, the framework makes contributions to the methodological discourse of performing arts, which makes vocal resonance a physiological phenomenon and a practice of art.

However, the research does not mention limitations. The framework was created through literature synthesis and pedagogical thinking instead of empirical testing. Future research should therefore validate the model through acoustic analysis, perceptual evaluation, and application to different vocal genres. Also, it can be expanded into other disciplines like speech therapy, psychology, and vocal health, which can make it even more relevant and useful.

In conclusion, the given paper introduces a ten-step framework of the methodology that brings tradition and science together to achieve the most balanced voice resonance. It demonstrates the possibility of integrative, practice-informed methods to improve pedagogy and scholarship. The current study contributes to a more comprehensive picture of the phenomenon of resonance and can be of beneficial use to singers, teachers and researchers in the performing arts and other areas by mediating between the knowledge gained through experience and the academic interpretation of the phenomenon.

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