



Research Article

The human voice: an organological examination of the voice as an instrument

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Abstract

In this study, the human voice is examined from an organological perspective as a musical instrument, and the contributions of this examination to voice training processes are discussed. Throughout history, the human voice has been used as a powerful tool for expression, both on an individual and societal level, and has held a significant place in musical contexts. The research explores the structural and functional similarities between the human voice and musical instruments, discussing how this knowledge can be utilized more effectively in voice training processes. The study, conducted using literature review and document analysis methods, emphasizes that elements such as the vibration of the vocal cords, the use of resonance cavities, breath control, and timbre directly affect the quality of the voice and vocal performance. The findings of the research suggest that a detailed examination of the organological characteristics of the human voice could contribute to the optimization of vocal performance by enabling the development of new techniques in the field of voice training. In this context, it has been concluded that organological perspectives should be more widely integrated into voice training processes. This study aims to make significant contributions to the deeper understanding of the human voice as a musical instrument and to the application of this understanding in educational processes.

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Introduction

The human voice has been used throughout history as a powerful tool for expression on both individual and societal levels. From ancient times to the present day, the human voice has played a crucial role as an element that shapes cultural identities of communities and conveys rituals and musical expressions. Activities such as speaking, singing, and other vocal performances serve as fundamental components of both individual communication and social interactions. In this context, the human voice functions not only as a means of communication but also plays a central role in conveying emotions, thoughts, and aesthetic values. The multifaceted nature of the voice places it at the intersection of various disciplines, including music, physics, linguistics, psychology, and biology.

Voice training, as a discipline aimed at maximizing this rich potential for expression by enabling individuals to use their voices consciously and with control, plays a significant role in the development of musical and vocal performances. According to Voloshyn (2021), voice training contributes to the enhancement of vocal abilities, the expansion of vocal range, and the improvement of vocal brilliance, while also fostering individual creativity and the development of a high level of professional skill in vocal performance. Voice training encompasses topics such as the correct use of the voice with proper techniques, the optimization of tone, articulation, and resonance, and is relevant for both professional musicians and amateur voice users. However, the effectiveness of the voice training process depends on a deep

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understanding of the biological, physiological, and acoustic properties of the human voice. Therefore, a detailed examination of the anatomical and functional structure of the human voice, as well as the mechanisms involved in voice production, is necessary.

Organology, as a scientific discipline focused on the structure, function, and historical development of musical instruments, provides significant insights into understanding the forms of musical expression and the technology behind these expressions. This discipline not only examines how instruments have evolved over time but also investigates the social, cultural, and technological contexts of these instruments. Organology offers a critical framework for understanding the evolution of music through the material structures of instruments, their usage, and technological advancements (Tresch and Dolan, 2013). Traditionally, organology has focused on the physical structures, production techniques, and historical evolution of instruments. However, when the human voice is considered as an instrument, the applicability of organology to this area remains underexplored. Examining the human voice from structural and functional perspectives similar to musical instruments could reveal how the voice can be evaluated as an instrument and how this evaluation can lead to more effective voice training.

The study of the human voice as an instrument has the potential to uncover the structural and functional similarities between vocal cords, resonance cavities, and other vocal organs with musical instruments. This approach could contribute to the development of new methods in the field of voice training by providing the theoretical and practical knowledge necessary for optimizing vocal performance. In particular, comparing the techniques used in voice production with those used in playing musical instruments and integrating these similarities into voice training processes could enhance the effectiveness of the training.

This study will explore how the human voice can be evaluated as an instrument from an organological perspective. In this framework, the structural and functional features of the human voice, vocal resonance, and acoustic factors will be detailed, and how this knowledge can be used more effectively in voice training processes will be discussed. The research aims to deepen the relationship between the organological characteristics of the human voice and voice training, contributing to a better understanding of the voice as an instrument. In this context, the study's contributions to the literature include the re-structuring of voice training methods through organological perspectives and the development of new approaches for applying these methods in vocal pedagogy.

This research aims to provide innovative contributions to the fields of organology and voice training by demonstrating how the consideration of the human voice as an instrument can be integrated into voice training processes. The study intends to add significant value to the existing body of knowledge in voice training, both theoretically and practically, and to inspire future research in the field.

Theoretical Framework

Throughout history, the human voice has served as a powerful tool for expression on both individual and societal levels, playing a crucial role in the formation of cultural identities, rituals, and musical expressions. The multidimensional nature of the human voice has made it a subject of study across various disciplines, including music, linguistics, psychology, and biology. In this context, the consideration of the human voice as an instrument necessitates an examination from an organological perspective to develop new approaches in voice training processes.

Organology, a field of study focused on the structure, function, and historical development of musical instruments, offers a framework for applying its fundamental principles to voice training when the human voice is evaluated as an instrument (Du, 2011). By examining the physiological structure of the human voice, including the vocal cords, resonance cavities, and other vocal organs, and by identifying their similarities with musical instruments, new techniques in voice training can be developed (Benninger, 2010). Specifically, the acoustic and physiological factors involved in the voice production process provide theoretical and practical insights for more effective use of the voice as an instrument (Owren, 2011).

Voice training aims to enhance individuals' vocal performance by enabling them to use their voices consciously and with control. A deep understanding of the anatomical and functional structure of the human voice is crucial for increasing the effectiveness of this training process (Greschner, 2014). From an organological perspective, incorporating

the structural and functional characteristics of the human voice into voice training processes facilitates the more effective use of the voice as an instrument, thereby enhancing the effectiveness of voice training (Shiwu, 2015).

In conclusion, this theoretical framework has allowed for the detailed examination of the organological characteristics of the human voice, leading to the development of new methods in the field of voice training. These frameworks contribute to a better understanding of the voice as an instrument while offering innovative approaches for the restructuring of voice training methods from an organological perspective and their application in vocal pedagogy.

Method

This study was conducted with the aim of evaluating the human voice as an instrument and approaching voice training processes from an organological perspective, employing literature review and document analysis methods. The literature review is designed to systematically gather and analyze existing research, theories, and findings in the relevant field. In this process, literature related to voice training, organology, vocal anatomy, acoustics, and musical instruments was examined, and the data obtained from this literature formed the foundational basis of the study.

The literature review serves as a crucial method for collecting the foundational information of the research. This approach allows researchers to systematically review the existing knowledge on the subject, identify relevant theoretical and conceptual frameworks, and understand the findings derived from previous studies. Moreover, the literature review guides the development of research questions and the selection of methodological approaches (Webster & Watson, 2002; Jesson, Matheson, & Lacey, 2011). In this study, academic works, books, journal articles, and other scientific sources related to voice training and organology were initially reviewed. These sources encompass studies that explain the anatomical, physiological, and acoustic properties of the human voice, research addressing voice training processes, and organological studies examining the structural features of musical instruments. During the literature review, relevant sources were identified using specific keywords (e.g., "organology," "voice training," "vocal anatomy," "musical instruments"), and the data obtained from these sources were systematically analyzed. The sources used in the literature review were selected from reliable and reputable scientific journals, academic publishers, and other academic platforms. The existing theories, findings, and discussions in the literature contributed to the formation of the theoretical framework of this research and enabled the development of new perspectives on how the human voice can be evaluated as an instrument. During the literature review process, similarities and differences among existing studies were examined, their findings were compared, and the implications of these findings for voice training and organology were discussed.

In addition to the literature review, this study also employed the document analysis method. Document analysis involves the examination and interpretation of existing written materials (Bowen, 2009). The documents analyzed in this research included academic articles, books, theses, reports, and other written materials that provided information on the organological characteristics of the human voice, vocal techniques, voice training processes, and the structural features of musical instruments.

During the document analysis process, documents that were directly related to the research topic were selected, and the data within these documents were analyzed in detail. The analyzed documents offered different perspectives on the structure, function, and training of the human voice, and the integration of these perspectives led to the research findings. The document analysis method facilitated the establishment of the theoretical foundations of the research, the verification of existing knowledge, and the evaluation of this knowledge in a new context.

Document analysis was particularly used to assess the existing knowledge in the fields of voice training and organology. The documents reviewed in the study provided significant data for understanding how the methods and techniques used in voice training processes could be developed through organological perspectives. Additionally, the similarities and differences between the human voice and musical instruments were compared based on the information obtained from these documents.

Data Analyses

The data collected in this study were analyzed using the descriptive analysis method. Descriptive analysis involves the systematic organization of data and the meaningful interpretation of these data (Yıldırım & Şimşek, 2018). In this study,

the data obtained through literature review and document analysis were classified under specific themes and categories, and these themes guided the subsequent analysis. The analysis focused on topics such as the organological characteristics of the human voice, the techniques used in voice training processes, and the acoustic and physiological properties of the voice. This analysis was conducted to ensure that the study's objectives were met and to demonstrate how existing knowledge in the literature can be re-evaluated from a new perspective.

Methodological Limitations

The methods employed in this study have certain limitations. Firstly, the literature review and document analysis methods rely on existing sources, and the accuracy and currency of these sources can influence the outcomes of the research. Additionally, these methods are based on the subjective interpretation of qualitative data, which may limit the generalizability of the findings. However, the methodological approach used in the research process has been carefully structured to minimize these limitations as much as possible.

Results and Discussion

Organological Characteristics of the Human Voice

The human voice, with its multidimensional structure, encompasses various elements that play a crucial role in voice training and performance. A detailed examination of these elements enables the development of new techniques for the effective use of the voice. One of the most fundamental elements in the production of the human voice is the vocal cords, which are thin muscular tissues located within the larynx. These tissues vibrate as air passes through them from the lungs, forming the basis of sound (Thomas, 1904). The function of the vocal cords parallels the vibration of strings in stringed musical instruments. Just as the vibration of strings forms the foundation of sound in stringed instruments, the vibration of the vocal cords similarly serves as the primary source of sound in the human voice. This similarity highlights the importance of proper and controlled use of the vocal cords during voice training. Much like the techniques employed in playing the strings of a musical instrument, the correct use of vocal cords with proper techniques in vocal performance can significantly enhance the quality and impact of the voice. In this context, the relationship between vocal cords and stringed instruments offers new approaches for developing vocal techniques. Recognizing and applying these similarities in voice training processes can assist vocalists in optimizing their performance.

Another significant element that determines the timbre, power, and clarity of the voice is the resonating cavities. Resonating cavities affect the spectral and temporal modulations of sound, leading to changes in timbre. For instance, the study by Elliott and Popeil (2018) examined how voice production parameters (laryngeal height, phonation modes, and resonance changes) influence the timbre of the voice. This study demonstrates that resonance plays a crucial role in determining the timbre of the voice. In the human body, the mouth, nasal cavity, sinuses, and other cavities function as areas that create resonance (Havel et al., 2014). These resonating cavities perform a function similar to the resonating bodies in musical instruments. For example, the body of a violin or guitar transforms the vibrations applied to the strings into sound waves and amplifies these waves. Similarly, in the human voice, resonating cavities influence the timbre and volume of the sound, thereby determining the characteristic features of the voice. From a voice training perspective, understanding how to use these resonating cavities can help vocalists control the power and timbre of their voices. With proper breathing techniques and resonance control, vocalists can maximize the use of their voices. This is critically important for enhancing the effectiveness of voice training.

Airflow also plays a central role in voice production, and this process bears significant similarities to the airflow observed in wind instruments. The human voice is produced through the controlled use of breath; in this process, air from the lungs causes the vocal cords to vibrate, producing sound (Zhang, 2016). In wind instruments, the controlled direction of airflow directly affects the instrument's sound production capacity and timbre. In the context of the human voice, proper control of breath is a determining factor in the quality and strength of the voice. In this regard, research on how the techniques used in wind instruments can be integrated into voice training processes can offer significant innovations. Learning how to use breath in vocal performance enables the vocalist to produce a stronger and more effective voice. This should be considered a fundamental component of voice training.

Another critical element that determines the characteristic quality of sound is timbre. Timbre is the unique characteristic of sound that distinguishes it from other sounds. This quality is of great importance in both the human voice and musical instruments. Factors influencing timbre include the characteristics of the environment in which the sound is produced, the techniques used, and the control of resonance (Elliott & Popeil, 2018; Risset & Wessel, 1999). In the human voice, timbre emerges as a result of vocal resonance, the structure of vocal organs, and the manner in which sound is produced. In musical instruments, timbre is determined by the instrument's structure, the materials used, and the playing techniques. Examining the similarities between instrumental timbre and vocal timbre during voice training processes allows for the development of new techniques on how the voice can be used more richly and effectively. These techniques can enable vocalists to express their voices more aesthetically and enhance the effectiveness of voice training.

Lastly, the similarities between vocal techniques and musical instrument techniques are also noteworthy. Techniques such as vibrato, glissando, and legato have their counterparts in musical instruments. These techniques enrich the expression of sound in both the human voice and instruments and increase the emotional impact of performance (Pang & Yoon, 2005). Teaching vocal techniques in harmony with instrumental techniques can introduce a new perspective to voice training processes. For example, the similarities between vibrato techniques on a violin or guitar and vocal vibrato offer an important reference point for understanding how these techniques can be used in voice training. These comparisons can help vocalists use their voices more effectively and controlled, thereby advancing their performance.

These findings illustrate how the human voice can be evaluated as an instrument and how this evaluation can be integrated into voice training processes. Examining the organological characteristics of the voice can facilitate the development of new techniques in the field of voice training, thereby contributing to the optimization of vocal performance. This approach provides significant contributions to both the theoretical and practical aspects of voice training.

Vocal Resonance and Acoustic Characteristics

Resonance and acoustics are fundamental elements that determine the quality, timbre, and perception of sound, and a proper understanding of these elements is crucial for enhancing the effectiveness of vocal training. The production of the human voice results from the combination of biological structures and acoustic principles. Among the most critical factors that determine the quality of sound in this process are the resonating cavities where the sound is produced and transmitted (Honda et al., 2008). Resonance refers to the amplification of the vibrations of a sound source at specific frequencies, resulting in a richer and fuller timbre. According to Vampola and colleagues (2020), structures in the human body, such as the mouth, nasal cavity, sinuses, and larynx, serve as the primary areas for creating resonance. These resonating cavities are crucial elements that affect the timbre, power, and frequency distribution of the sound. Effective control of resonance enables the voice to be heard more powerfully, clearly, and aesthetically.

Integrating vocal resonance into voice training processes allows vocalists to use their voices more consciously and controlled (Holmes, 2021). The control of resonance is a fundamental skill required to optimize the natural characteristics of the voice. In this context, it is crucial for students to be aware of the resonating cavities during voice training and to learn how to utilize these cavities. For example, learning how to direct the voice to chest resonance, head resonance, or mask resonance allows for the production of sound in different tones and timbres. Teaching these techniques helps vocalists achieve greater flexibility and variety in their voices.

Acoustic characteristics also play a direct role in the quality of vocal performance. Acoustics, as a branch of science that studies the physical properties of sound, involves the production, propagation, and perception of sound waves (Gladden, 2016). The acoustic characteristics of the human voice are defined by elements such as frequency, amplitude, wavelength, and timbre. Frequency determines the pitch of the sound, amplitude determines the power, and wavelength determines the duration of sound perception. Each of these acoustic parameters influences how the sound will be heard and perceived

During voice training, a correct understanding of acoustic principles is essential for vocalists to optimize their voices. The combination of acoustic knowledge with vocal techniques enables the development of strategies for how the voice will be heard in various environments. For example, determining how the voice will project better in a concert hall or

how it will be recorded in a studio setting is based on acoustic knowledge. When vocal training is structured to include this information, vocalists can control the acoustic characteristics of their voices more effectively. This is an important factor that enhances the quality and effectiveness of voice training.

Understanding resonance and acoustic characteristics is important not only from a technical perspective but also from the standpoint of expressive power. Vocal performance involves emotional and aesthetic expression in addition to technical skills (Holmes, 2016). Resonance and acoustics, as elements that enrich and deepen this expression, enhance the vocalist's impact on the listener. For instance, a singer's ability to present the same melody in different emotional tones by using various resonance techniques directly affects the listener's emotional response. The correct use of acoustic properties provides mechanical support for this emotional impact. Therefore, integrating these elements into voice training processes can contribute to the development of vocalists not only technically but also artistically.

It is possible to state that resonance and acoustic characteristics are fundamental elements that ensure the most effective use of the human voice. The inclusion of these characteristics in voice training processes can help vocalists optimize their performance. Resonance control and acoustic knowledge are necessary to bring out the best in the natural characteristics of the voice. Vocal training becomes more comprehensive and effective with the correct teaching of these elements. In this context, studying resonance and acoustic characteristics during the voice training process and researching how to apply this knowledge in practice is crucial for improving the quality of vocal performance. The effective use of resonance and acoustic characteristics in voice training processes allows for the development of vocal performance both technically and artistically. These approaches contribute to establishing voice training on more conscious, scientific, and artistic foundations.

The Human Voice from the Perspective of Vocal Training

Vocal training is a process that enables individuals to use their voices consciously, with control, and in a technically correct manner (Steinhauer, 2023). This process aims to equip vocalists with the necessary knowledge and skills to unlock the full potential of their voices, enhance the quality of their sound, and maximize vocal performance. Vocal training focuses not only on the development of technical skills but also on the use of the voice as an aesthetic tool. Therefore, the methods and approaches used in vocal training should be shaped based on the anatomical, physiological, and acoustic characteristics of the voice.

From an organological perspective, when the human voice is considered as an instrument, vocal training processes can be re-evaluated through this lens. This approach explores how the structural and functional features of the voice can be utilized more effectively. For instance, when comparing the structure and function of the vocal cords to the strings of a stringed instrument, it becomes evident that the techniques used in vocal training can be developed in alignment with these similarities. The correct use of the vocal cords, much like the proper technique used when playing an instrument's strings, directly affects the quality of the sound. In this context, focusing on how to control the vocal cords, achieve the correct vibration, and optimize this vibration during vocal training allows for more effective use of the voice.

Resonating cavities are another critical element in vocal training. The resonating cavities in the human body are fundamental factors that determine the timbre and power of the voice. These cavities provide the natural resonance of the voice, allowing it to have a richer and fuller timbre. During vocal training, studies on how to use and control these resonating cavities help vocalists manage their voices more consciously. For example, understanding how to use chest resonance, develop head resonance, or effectively utilize mask resonance enables the production of sound in different tones and timbres. These techniques increase the flexibility of vocal performance and facilitate vocalists' adaptation to various musical styles

Breath control is another crucial component of the vocal training process. Breath is the energy source necessary for the production of sound, and therefore, the correct and effective use of breath determines the quality and power of the voice. Breath techniques applied to wind instruments can be integrated into vocal training and taught to vocalists during their education. The correct teaching and application of these techniques allow vocalists to use their voices for longer periods without fatigue. Additionally, breath control plays a critical role in managing the dynamics and expression of

the voice. Proper breath management enables the voice to be used in a broader dynamic range and more controlled manner.

Vocal timbre and acoustic characteristics bridge aesthetic and technical goals in vocal training processes. The timbre of the voice is a fundamental element that defines a vocalist's unique vocal identity. The techniques used during vocal training to develop and optimize timbre show similarities with those applied to musical instruments (Giraldo et al., 2019). For instance, the factors that influence timbre in instruments like the violin or flute similarly affect the human voice. Elements such as resonating cavities, breath control, and the use of vocal cords are considered during vocal training to develop techniques that ensure the best possible sound from vocalists.

Considering vocal techniques from a vocal training perspective offers new approaches to how the voice can be used as an instrument. Vocal techniques are practical applications that determine how the voice should be used to achieve a specific aesthetic purpose. Techniques such as vibrato, glissando, and legato enrich vocal performance and enhance its expression. Comparing these techniques with those used in musical instruments contributes to more effective teaching during vocal training (Daffern, 2017). Addressing vocal techniques in this manner allows vocalists to use their voices more controlled and aesthetically.

From the perspective of vocal training, when the human voice is treated as an instrument, a more conscious and systematic examination of its structural, functional, and acoustic characteristics is necessary. This approach ensures that the techniques and methods used in vocal training processes are more effective. Restructuring vocal training with organological perspectives allows vocalists to better understand, control, and develop their voices. This process aims to strengthen not only technical skills but also artistic expression.

The findings have discussed how the organological characteristics of the human voice can be evaluated from a vocal training perspective and how these evaluations can be integrated into vocal training processes. This discussion can contribute to the development of vocal training on more effective and scientifically based foundations. The acquisition of the knowledge and skills necessary for optimizing vocal performance and utilizing the voice to its fullest potential is among the primary goals of this process. In this context, examining the organological characteristics of the human voice from a vocal training perspective enriches vocal pedagogy and contributes to the artistic development of vocalists.

Conclusion

This study focuses on examining the human voice from an organological perspective and exploring how this examination can be integrated into vocal training processes. Conducted through literature review and document analysis methods, this research aims to reveal how vocal training can be restructured when the human voice is considered as a musical instrument. The findings suggest that the structural and functional characteristics of the human voice, along with its similarities to musical instruments, can provide significant innovations in vocal training processes.

According to the results of the study, the human voice exhibits notable similarities to musical instruments in terms of elements such as the vibration of the vocal cords, the use of resonating cavities, breath control, and timbre. The correct use and control of the vocal cords, akin to the strings of stringed instruments, directly impact the quality of sound. Resonating cavities, as fundamental factors determining the timbre and power of the voice, play a critical role in optimizing vocal performance. Breath control emerges as a key factor in managing both the power and dynamic range of the voice.

This research demonstrates that approaching the human voice from an organological perspective can pave the way for the development of new methods in the field of vocal training. Comparing vocal techniques with musical instrument techniques enriches both the theoretical and practical dimensions of vocal training and contributes to the conscious and effective development of vocalists' performances.

In this context, it is recommended that organological perspectives be more broadly integrated into the vocal training process. These approaches not only facilitate the development of technical skills but also enhance the artistic expression of vocalists. The study makes a significant contribution to understanding the human voice more deeply as an instrument and applying this understanding to educational processes.

Future studies might aim to increase the effectiveness of vocal training methods by testing the findings of this research on a broader participant base. Additionally, research into how the organological characteristics of the human voice vary across different musical styles and cultural contexts could further deepen the knowledge in this field. In line with this, diversifying and enriching the practices in vocal training can help vocalists achieve higher levels of both technical and artistic proficiency.

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