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Musopathy and clisonics: ancient sound-healing traditions, scientific principles, tonation breathing techniques and emerging clinical applications

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Abstract

Sound has made human civilization, healing, culture and treatment. Ancient Indian, Chinese, Greek and Tibetan civilizations have various concepts of sound, vibration, consciousness and well-being. Historical bases for the healing power of sound include Pythagorean based mathematical ratios of musical intervals, Tibetan traditions of singing bowls, Chinese Five-Element Music and Indian Swara, Nada and Swara Yoga. Modern music therapy is grounded in psychology, neurology, healthcare, rehabilitation and behavioral sciences. Musical compositions used in clinical trials that are culturally and regionally different are faced with the challenges of standardization, repeatability and scientific validity. The study critically examines musopathy, a new paradigm of sound therapy and physiology. Focus on: Active Musopathy and Tonation Breathing Techniques (TBT) Introduction and types of TBT Difference from standard breathing Physiological and psychological benefits of TBT Importance of systematic sound-based research Physical properties of sound Sound propagation through different media Sonic, ultrasonic and infrasonic frequencies Effects of acoustic stimulation on biological tissues and organs (mechanotransduction effects) Clisonics also recommends controlling the sound stimuli for clinical study. It explores how volume, speed, pitch, rhythm and length can be manipulated to generate replicable scientific sound environments. Evidence-based research strategy that integrates traditional wisdom and current science, supported by historical literature and transdisciplinary studies in human health, animal welfare, cellular biology and acoustics.

Keywords: Musopathy, Clisonics, Sound Healing, Music Therapy, Pythagorean Musical Ratios, Tibetan Singing Bowls

1. Introduction

Sound is a fundamental physical phenomenon that influences human perception, communication, emotional experiences and interactions with the surrounding environment. Throughout history, sound has been used in religious ceremonies, meditation, traditional healing practices, cultural activities and social communication. The relationship between music and health has attracted increasing academic interest, particularly in music therapy, auditory neuroscience, psychophysiology and rehabilitation. Historical developments in music therapy demonstrate that sound has been associated with healing practices since antiquity. Ancient Indian traditions also recognised the importance of music and sound in relation to human health and well-being. Gangopadhyay and Prasad (2022) examined therapeutic elements of music in ancient Indian Ayurvedic literature, particularly the Bṛhattrayī. Similarly, the Carakasaṃhitā provides an important historical source for understanding traditional Indian approaches to health and well-being (Caraka, 2016). Different civilisations developed distinctive systems for understanding sound. Greek philosophical traditions explored mathematical relationships between musical intervals, while Tibetan traditions incorporated chanting, singing bowls and ritual sound practices. Chinese traditions developed sound-related practices associated with traditional health philosophies. Indian traditions emphasised Swara, Nada, Raga and the relationship between sound and consciousness. Modern scientific investigation provides opportunities to examine these historical practices through measurable acoustic, physiological and psychological parameters. In

this context, Musopathy and Clisonics can be explored as conceptual frameworks for investigating the controlled application of sound and music in health-related research.

2. Power of sound and ratios of various note intervals to the tonic

The power of sound arises from its physical properties, including frequency, amplitude, wavelength, intensity, timbre and duration. These properties determine how sound is generated, transmitted and perceived by the auditory system. Musical intervals are based on frequency relationships between notes. The tonic serves as the reference note in a musical system, while other notes are understood through their frequency ratios relative to it. The Pythagorean tradition established important mathematical relationships between musical intervals. Representative frequency ratios include:

Musical interval	Frequency ratio to tonic
Octave	2:1
Perfect fifth	3:2
Perfect fourth	4:3
Major second	9:8
Major third	81:64
Minor third	32:27
Major sixth	27:16

These mathematical relationships demonstrate the significance of numerical proportions in musical organisation. However, different musical traditions employ different tuning systems and their intervals do not always correspond exactly to Pythagorean ratios. Understanding the relationship between the tonic and other musical intervals is important for investigating tonal structures, consonance, auditory perception and the acoustic characteristics of musical compositions. McDermott and Simoncelli (2011) demonstrated the importance of auditory statistics in understanding the perception of complex sound textures.

3. Ancient systems of sound healing

3.1 Tibetan Sound Traditions

Tibetan sound traditions incorporate chanting, mantra recitation, singing bowls and ritual instruments. Singing bowls generate complex acoustic vibrations and sustained resonances that are used in meditation and contemplative practices. The historical relationship between music and healing has developed through different cultural and spiritual traditions. However, traditional therapeutic claims must be distinguished from experimentally established clinical outcomes. The scientific investigation of Tibetan sound practices requires measurement of frequency, intensity, resonance, duration and individual auditory responses.

3.2 Pythagorean Sound Philosophy

The Pythagorean philosophical tradition associated musical harmony with numerical relationships. Musical intervals were understood through mathematical proportions, particularly the octave, perfect fifth and perfect fourth. This approach established an important historical connection between mathematics and music. The numerical structure of musical intervals provides a foundation for investigating acoustic relationships and auditory perception. The Pythagorean approach is particularly relevant to contemporary investigations of frequency ratios, tonal organisation and standardised sound generation.

3.3 Chinese Sound Traditions

Traditional Chinese health philosophies associate sound with the relationship between the human body, nature and traditional systems of health understanding. Chinese Five-Element Music has also been investigated through contemporary clinical research. Liao *et al.* (2013) conducted a randomised controlled trial examining the effects of Chinese Medicine Five-Element Music on the quality of life of patients with advanced cancer. This research illustrates the possibility of examining culturally rooted musical practices through controlled clinical methodologies. Nevertheless, further research is necessary to establish the mechanisms, generalisability and long-term effectiveness of such interventions.

3.4 Indian Swara Yoga and Nada Traditions

Indian musical and philosophical traditions provide an extensive understanding of Swara, Nada, Raga and the relationship between sound and consciousness. Swara Yoga explores the relationship between breathing, awareness and subtle physiological processes. Indian classical music is structured around seven fundamental Swaras: Sa, Re, Ga, Ma, Pa, Dha and Ni. Gangopadhyay and Prasad (2022) examined therapeutic elements of music in ancient Indian literature, demonstrating the historical importance of music within traditional knowledge systems. The Carakasaṃhitā also provides a significant historical context for examining Indian concepts of health and well-being (Caraka, 2016). These traditions provide opportunities for interdisciplinary investigation involving Indian Knowledge Systems, musicology, psychology, physiology and neuroscience.

4. Critical assessment of music therapy across the world in recent times

Music therapy has developed internationally as an interdisciplinary field involving healthcare, psychology, education, rehabilitation and neuroscience. Contemporary research examines the potential influence of music on emotional regulation, anxiety, stress, pain perception, memory, cognitive engagement, motor coordination and social interaction. Liao *et al.* (2013) investigated Chinese Five-Element Music among patients with advanced cancer, illustrating the application of traditional musical concepts in clinical research. Leuk *et al.* (2020) reviewed acoustic-based interventions for improving motor symptoms in Parkinson's disease, demonstrating the relevance of auditory stimulation in neurological rehabilitation. However, music therapy research faces several methodological challenges. Musical preferences, language, cultural backgrounds, familiarity with particular compositions and individual emotional associations can influence research outcomes. Brown (2002) emphasised the importance of culturally centred music therapy practice. This perspective is important because musical interventions cannot always be considered universally equivalent across populations. The use of a specific regional or culturally familiar concert composition as a universal clinical intervention may introduce confounding variables. Consequently, clinical researchers should consider both cultural context and measurable acoustic parameters when designing experimental studies.

5. Introduction to musopathy

Musopathy is considered in this article as an emerging conceptual framework for examining the therapeutic and physiological dimensions of structured sound and musical stimulation.

It proposes the systematic study of sound-based interventions through the interaction of acoustic characteristics, human physiology, psychological responses and individual experiences.

The proposed framework includes:

a. Controlled sound stimulation.
b. Musical frequency and interval analysis.
c. Rhythm and tempo modification.
d. Vocalisation and breathing coordination.
e. Relaxation and attention-based practices.
f. Physiological and psychological assessment.
g. Investigation of sound interactions with biological systems.

Research examining the effects of sound and music on organisms and cells provides an interdisciplinary context for this approach (Exbrayat & Brun, 2019). However, Musopathy should presently be understood as a proposed research framework rather than an established independent medical specialty or clinically validated replacement for conventional healthcare.

6. Necessity for musopathy

There is a growing need for scientifically structured research into sound-based interventions. Conventional music therapy often involves musical compositions, therapeutic listening, singing and active musical participation. However, the individual acoustic variables responsible for particular physiological or psychological responses are not always isolated.

Musopathy may provide a conceptual framework for examining these variables independently and collectively.

Its potential research significance includes:

a. Standardisation of sound stimuli.
b. Identification of individual responses to sound.
c. Investigation of physiological mechanisms.
d. Development of reproducible acoustic protocols.
e. Integration of traditional musical knowledge with contemporary research.
f. Examination of sound exposure in clinical and experimental environments.
g. Development of interdisciplinary research between acoustics, neuroscience and healthcare.

The research examining sound and biological systems by Exbrayat and Brun (2019) provides an additional scientific context for investigating these possibilities.

7. Properties of sound and propagation through a medium

Sound is a mechanical wave that requires a medium for propagation. It travels through gases, liquids and solids by means of particle vibrations and the transfer of acoustic energy.

The principal properties of sound include:

a. **Frequency:** The number of oscillations per second, measured in Hertz (Hz).
b. **Amplitude:** The magnitude of the pressure variation associated with a sound wave.
c. **Wavelength:** The physical distance between corresponding points of successive waves.

d. **Intensity:** The acoustic power transmitted per unit area.
e. **Timbre:** The characteristic quality that distinguishes one sound source from another.
f. **Duration:** The period for which a sound is present.
g. **Resonance:** The enhancement of vibration when a system is stimulated near its natural frequency. Sound propagation depends on the physical characteristics of the medium, including density, elasticity and temperature. Ludwig (1950) investigated the velocity of sound through biological tissues and the acoustic impedance of tissues. This work provides an important foundation for understanding the interaction between acoustic waves and biological structures.

8. Ultrasonic, sonic and infrasonic frequencies in therapy

Sound frequencies can be classified according to their relationship with human auditory perception.

Category	Frequency range
Infrasonic	Below 20 Hz
Audible or sonic	Approximately 20 Hz–20,000 Hz
Ultrasonic	Above 20,000 Hz

8.1 Infrasonic Frequencies

Infrasonic frequencies are below the conventional range of human hearing. Their biological effects depend on intensity, duration, exposure conditions and the characteristics of the medium. Research into infrasonic exposure requires appropriate acoustic measurements and safety considerations.

8.2 Sonic Frequencies

Sonic or audible frequencies constitute the conventional range of human hearing. Music therapy, auditory stimulation and sound-based relaxation interventions generally operate within this range. The characteristics of audible sound, including pitch, volume, rhythm and timbre, are relevant to auditory perception and clinical investigation (McDermott & Simoncelli, 2011).

8.3 Ultrasonic Frequencies

Ultrasonic frequencies exceed 20,000 Hz. Ultrasound has established applications in medical imaging and certain therapeutic procedures.

Its biological effects are different from those of ordinary musical sound. Research on high-frequency sound waves and biological tissues includes the historical investigation by Harvey (1929). Consequently, therapeutic applications of ultrasound should not be equated with conventional music therapy or general sound-healing practices.

9. Effect of sound in tissues and organs through mechanotransduction

Mechanotransduction refers to the process through which cells convert mechanical stimuli into biochemical and cellular responses. Mechanical forces can influence cell membranes, mechanosensitive ion channels, cytoskeletal structures and intracellular signalling pathways. Acoustic waves may interact with biological tissues depending on frequency, intensity, duration and mode of delivery. Ludwig (1950) examined acoustic velocity and impedance in biological tissues, providing a basis for understanding acoustic transmission through the body. Harvey (1929) investigated the effects of high-frequency sound waves on heart muscle and other irritable tissues. Exbrayat and Brun (2019) reviewed the effects of sound and music on organisms and cells. Similarly, Cho *et al.* (2022) investigated the effects of sound on neuronal maturation of neuroblastoma cells and the repair of damaged tissues. These studies demonstrate the importance of examining sound at cellular and tissue levels. However, findings from ultrasound, laboratory models and cellular experiments must be distinguished from the clinical effects of ordinary audible music in humans. Further research is necessary to establish the mechanisms through which different acoustic exposures influence biological systems.

10. Active musopathy and tonation breathing techniques (tbt)

Active Musopathy refers to an approach in which individuals actively participate in sound production rather than exclusively listening to recorded music. Tonation Breathing Techniques (TBT) are considered here as a proposed structured approach combining controlled breathing, vocal tonation and sustained sound production. The framework may provide opportunities to investigate the relationship between respiratory activity, vocal production, auditory feedback and subjective relaxation.

10.1 Introduction to TBT

TBT involves the coordinated use of breathing patterns and vocalised tonal sounds. The proposed technique may include controlled inhalation, sustained exhalation, vowel tonation, humming and rhythmic vocalisation. The objective of investigating TBT is to understand how breathing and sound production may interact with respiratory mechanics, attention and psychological responses.

10.2 Types of TBT

Potential categories for research and protocol development include:

a. **Sustained Vowel Tonation:** Producing sustained vowel sounds during controlled exhalation.

b. **Controlled Exhalation with Vocal Sound:** Coordinating a gradual exhalation with continuous vocal production.

c. **Rhythmic Breathing with Tonal Production:** Combining structured respiratory patterns with repeated tonal sounds.

d. **Gentle Humming-Based Breathing:** Producing humming sounds during controlled exhalation.

e. **Guided Tonal Breathing with Pauses:** Combining vocal tonation with defined pauses between respiratory cycles.

f. **Structured Breathing with Changing Pitch:** Investigating different pitch patterns during controlled vocalisation.

These categories are proposed descriptive research approaches rather than independently validated clinical treatment protocols.

10.3 Differences Between TBT and Other Breathing Techniques

Conventional breathing techniques generally emphasise respiratory rhythm, inhalation, exhalation, breath awareness or breath retention. TBT introduces a vocal or tonal component to the breathing process. It therefore provides an opportunity to study respiratory mechanics, phonation, auditory feedback and subjective relaxation together.

Parameter	Conventional breathing techniques	Proposed TBT
Main component	Respiratory control	Breathing and tonation
Vocalisation	Not essential	Included
Auditory feedback	Usually limited	Integrated component
Pitch variation	Not essential	May be included
Research focus	Respiratory parameters	Respiratory and acoustic parameters
Sound production	Not necessary	Active participation

10.4 Potential Benefits of TBT

Potential research outcomes include:

a. Improved awareness of breathing.

b. Changes in respiratory rhythm.

c. Subjective relaxation.

d. Emotional regulation.

e. Attention and concentration.

f. Investigation of vocal-respiratory coordination.

These possible outcomes require systematic clinical investigation and should not be presented as guaranteed medical benefits.

11. Introduction to clisonics

Clisonics is considered in this article as a proposed framework for the systematic creation and clinical investigation of controlled sound stimuli. Its central research principle is to distinguish the fundamental acoustic variables of sound from cultural, regional and musical preferences. Instead of relying exclusively on existing concert music, researchers can create controlled sound samples that allow individual acoustic parameters to be modified and evaluated. Clisonics may therefore contribute to the development of reproducible experimental protocols through:

a. Standardised sound generation.

b. Controlled frequency selection.

c. Volume and intensity modification.

d. Tempo and rhythm variation.

e. Duration standardisation.

f. Comparison of different acoustic stimuli.

g. Measurement of physiological and psychological responses.

The study of sound textures and auditory statistics provides a scientific background for investigating controlled sound generation (McDermott & Simoncelli, 2011).

12. Unreliability of using culture- and region-specific concert music for health studies

Using existing concert music in clinical studies may introduce several methodological limitations. First, musical familiarity differs between individuals and cultural groups. Second, emotional associations with a particular composition may influence physiological and psychological responses. Third, different compositions contain varying tempos, rhythms, dynamics, tonal structures and instrumental characteristics. Brown (2002) emphasised the importance of cultural context in music therapy practice. This indicates that musical interventions should be evaluated with appropriate consideration of the participants' cultural backgrounds. For example, a musical composition familiar to one regional population may be unfamiliar to another. Differences in musical preference and previous exposure may influence the experience of listening. Therefore, a clinical study using one culturally specific

musical composition may not establish whether the observed response results from its tempo, volume, melodic structure, emotional associations or cultural familiarity. This does not mean that traditional or regional music lacks therapeutic relevance. Rather, it demonstrates the importance of controlling experimental variables and reporting cultural context. Clisonics proposes an alternative research approach in which sound stimuli can be created and modified according to measurable acoustic characteristics.

13. Fundamental mechanics of music: volume and tempo

Two important variables in music-based clinical research are volume and tempo.

13.1 Volume

Volume refers to the perceived loudness of sound. It is influenced by sound pressure level, frequency content and listening conditions. Clinical research should measure sound exposure in decibels rather than relying exclusively on subjective descriptions of volume.

13.2 Tempo

Tempo refers to the speed of a musical or rhythmic sequence, commonly measured in beats per minute (BPM). Different tempos may produce different auditory and behavioural experiences. However, the effects of tempo should be examined through controlled experiments rather than assumed to be uniform across individuals.

13.3 Other Fundamental Musical Variables

Other important variables include:

- Frequency and pitch.
- Rhythm and beat.
- Timbre.
- Harmonic structure.
- Sound duration.
- Silence and pauses.
- Sound pressure level.
- Repetition and musical patterns.

Systematic variation of these parameters can help researchers investigate their independent and combined effects.

14. Creating sounds for clinical studies

The development of sound stimuli for clinical research should follow a standardised methodology. The researcher should first identify the experimental objective and relevant population. Subsequently, sound samples should be generated using controlled acoustic parameters.

Important considerations include:

a. Standardised frequency and tonal structure.
b. Measured sound pressure levels.
c. Defined tempo and rhythmic patterns.
d. Consistent duration of exposure.
e. Controlled playback equipment.
f. Recording of environmental noise.
g. Participant-specific safety and comfort.
h. Ethical approval and informed consent.
i. Documentation of the sound-generation procedure.
j. Reproducibility of the experimental stimulus.

The resulting sound stimuli should be documented so that other researchers can reproduce the experiment.

15. Applying clisonics in clinical studies by changing fundamental variables

Clisonics can be investigated through experimental designs in which one or more acoustic variables are modified while other conditions remain constant. For example, a study could compare different tempos while maintaining the same sound intensity and duration. Similarly, researchers could investigate different sound-pressure levels while keeping the frequency structure and tempo unchanged.

15.1 Proposed Experimental Framework

Experimental variable	Possible research modification	Possible outcome measures
Volume	Different controlled sound-pressure levels	Comfort, stress and auditory response
Tempo	Different BPM conditions	Heart rate and subjective response
Frequency	Different tonal frequencies	Auditory perception and physiological response
Duration	Different exposure periods	Response over time
Rhythm	Regular and irregular patterns	Attention and behavioural response
Timbre	Different sound qualities	Preference and auditory response

15.2 Clinical Research Designs

Possible research designs include:

- Baseline and post-intervention comparisons.
- Randomised controlled trials.
- Cross-over experimental designs.

- Comparative studies of standardised sound stimuli.
- Mixed-methods investigations combining physiological measurements and participant experiences.

Relevant outcome measures may include heart rate, respiratory rate, blood pressure, perceived stress, anxiety scales and other validated clinical measures selected according to the research question.

15.3 Animal-Based Research and Sound Stimulation

Animal research provides additional opportunities for examining sound exposure and biological responses. Ciborowska *et al.* (2021) reviewed the effects of music on livestock, including cattle, poultry and pigs. Moregaonkar *et al.* (2006) investigated Indian instrumental music in relation to milk-production-related factors in Deoni cows. Lechuga *et al.* (2023) examined music and tactile stimuli during daily milking and their relationship with dairy cow welfare and productivity. González-Grajales *et al.* (2019) investigated auditory and visual stimuli in relation to glucose metabolism in Holstein dairy cattle. Donghai *et al.* (2018) examined Latin, Rock and African percussion music in relation to protein and energy metabolism in cows. Campo *et al.* (2005) investigated the effects of specific noise and music stimuli on stress and fear levels in laying hens. These studies indicate that sound and auditory environments are relevant research subjects in animal welfare and agricultural sciences. However, their results should not automatically be generalised to human clinical applications.

15.4 Biological and Microbiological Research

Sound-related research also extends to biological and microbiological systems. Exbrayat and Brun (2019) reviewed the effects of sound and music on organisms and cells. Cho *et al.* (2022) examined sound-related effects on neuronal maturation and tissue repair. Sarvaiya and Kothari (2017) investigated the influence of audible music on microbial growth, metabolism and antibiotic susceptibility. These studies provide additional interdisciplinary perspectives for understanding sound-related biological responses. Their findings must be interpreted according to the specific experimental conditions organisms and exposure parameters.

16. Research challenges and future directions

The development of Musopathy and Clisonics faces several important challenges.

These include:

a. Absence of universally accepted definitions.
b. Limited standardisation of sound-based interventions.
c. Individual differences in auditory perception.
d. Cultural and regional variations in musical experience.
e. Methodological heterogeneity in existing studies.
f. Difficulty isolating individual acoustic variables.
g. Limited large-scale clinical evidence.
h. Need for interdisciplinary research collaboration.

Clark *et al.* (2025) discuss the relationship between noise and health and well-being, highlighting the importance of considering both beneficial and potentially harmful sound exposures. Future research should prioritise collaboration between acousticians, musicologists, psychologists, neuroscientists, medical professionals, agricultural researchers and clinical scientists. The development of open acoustic stimulus libraries, reproducible protocols, standardised outcome measures and multicentre clinical studies may contribute to stronger scientific evidence.

17. Conclusion

Sound represents an important area of interdisciplinary investigation connecting physics, music, physiology, psychology, biology and human well-being. Ancient traditions from Tibet, Greece, China and India provide historical and philosophical perspectives on the relationship between sound and human experience. Contemporary research has expanded the investigation of sound into music therapy, neuroscience, acoustics, animal welfare, cellular biology and clinical interventions. Historical Indian literature provides an important foundation for understanding traditional therapeutic perspectives on music (Caraka, 2016; Gangopadhyay & Prasad, 2022). Contemporary investigations into Chinese Five-Element Music and acoustic-based neurological interventions demonstrate the continuing development of research in this area (Liao *et al.*, 2013; Leuk *et al.*, 2020). Musopathy offers a proposed framework for examining sound-based interventions through measurable acoustic and physiological parameters. Active Musopathy and Tonation Breathing Techniques

provide possible avenues for investigating the interaction between breathing and vocalisation. Clisonics emphasises the controlled creation and modification of acoustic stimuli for clinical research. The future scientific development of these approaches depends on standardised definitions, measurable parameters, rigorous experimental design, ethical clinical investigation and independent validation. An evidence-based approach can help distinguish traditional knowledge, promising hypotheses and clinically established outcomes. The integration of acoustic science, Indian Knowledge Systems, neuroscience and clinical research may contribute to a more systematic understanding of sound and health.

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