Sonic Genealogies and Mystical Memory: Tracing Jalāl al-Dīn al-Rūmī's Epigenetic Influence on Indo-Islamic Musical Consciousness

İsmail Eraslan | https://orcid.org/0000-0002-6316-0189 | ismaileraslan@trabzon.edu.tr

Trabzon University, Fatih Faculty of Education, Department of Fine Arts Education, Trabzon, Türkiye

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Abstract

This study examines the transmission of mystical memory in Islamic musical traditions by exploring how the intellectual and aesthetic legacy of Mawlānā Jalāl al-Dīn Rūmī (d. 672/1273) resonated across the Indo-Islamic cultural sphere through epigenetic and neuroaesthetic mechanisms. While previous scholarship has primarily emphasized Rûmî's written works and spiritual influence, this article foregrounds his auditory metaphysics, focusing particularly on samāʿ and qawwalī as ritual practices of divine remembrance (dhikr) and embodied knowledge production. By situating sound as the central epistemic axis, the research demonstrates that Rûmî's philosophy should be understood not only as poetic symbolism but as a sonic epistemology grounded in ritual embodiment. Methodologically, the study employs an AI-assisted comparative framework integrating spectral sound analysis (using Librosa and Praat software) to compare rhythmic density, melodic intensity, and vocal texture between Mevlevī samāʿ and Chishtī qawwalī performances. This approach allows the research to visualize and quantify how repetition, rhythm, and bodily participation generate neuroplastic traces of mystical memory. The findings reveal that Mevlevī rotation and breath-centered chanting of "Hu" produce inner resonance, while Chishtī qawwalī's intense vocal invocations such as "Maulā" and "ʿAlī" induce collective trance states. These shared patterns demonstrate that mystical sound functions as an intergenerational medium of cultural memory, sustaining epistemic continuity across centuries. Furthermore, the study highlights the resilience of sonic traditions during colonial ruptures, showing how music functioned as a form of mystical resistance when textual expression was silenced. Ultimately, Rûmî's auditory philosophy is reinterpreted as a biocultural, embodied, and epigenetic phenomenon that bridges spirituality, cognition, and sensory experience. The research offers new insights for Islamic studies, music-based pedagogy, neuroaesthetic learning models, and postcolonial epistemology, demonstrating that sound remains a vital agent of knowledge, memory, and identity transmission in the Islamic world.

Keywords

Islamic Music, Mawlānā Jalāl al-Dīn Rūmī, Epigenetic Memory, Qawwalī, Neuroaesthetics.

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Ses Soybilimleri ve Mistik Hafıza: Celâleddîn Rûmî'nin Hint-İslam Müzikal Bilincine Epigenetik Etkisi

İsmail Eraslan | https://orcid.org/0000-0002-6316-0189 | ismaileraslan@trabzon.edu.tr
Trabzon Üniversitesi, Fatih Eğitim Fakültesi, Güzel Sanatlar Eğitimi Bölümü, Trabzon, Türkiye
ROR ID: https://ror.org/04mmwq306

Öz

Bu çalışma, İslâm müzik geleneğinde mistik hafızanın aktarım biçimlerini, Mevlânâ Celâleddîn-i Rûmî'nin (ö. 672/1273) düşünsel ve estetik mirası üzerinden ele almaktadır. Araştırma, Rûmî'nin yazılı eserleri ve metafizik etkilerinin ötesine geçerek sesin ontolojik bir bilgi alanı olarak nasıl bir işlev gördüğünü, özellikle semâ ve kavvâlî ritüelleri bağlamında zikir pratikleri aracılığıyla hakikatin işitsel ve bedensel tecrübeye dönüşümünü incelemektedir. Yöntemsel olarak, yapay zekâ destekli ses analizi (Librosa ve Praat yazılımlarıyla) kullanılarak Mevlevî semâ törenleri ile Çiştî kavvâlî icraları arasındaki ritmik yoğunluk, melodik yoğunlaşma ve ses dokusu benzerlikleri karşılaştırmalı biçimde analiz edilmiştir. Bu yaklaşım, ritüel tekrarın nöroplastik etkilerini ve sesin kuşaklar arası hafıza oluşumundaki rolünü görselleştirmeye olanak tanımaktadır. Bulgular, Mevlevî semâlarında "Hû" zikrinin nefes merkezli bir içsel yankı oluşturduğunu; Çiştî kavvâlîlerinde ise "Mevlâ" ve "Ali" gibi yoğun ses tekrarlarının toplu vecd hâlleri yarattığını ortaya koymaktadır. Bu ortak desenler, mistik sesin kültürel hafızanın kuşaklar ötesi bir taşıyıcısı olarak işlev gördüğünü göstermektedir. Ayrıca araştırma, sömürge dönemi boyunca ses temelli mistik pratiklerin susturulmasına rağmen müziğin bir direniş ve hafıza biçimi olarak varlığını sürdürdüğünü vurgulamaktadır. Sonuç olarak Rûmî'nin işitsel felsefesi, yalnızca bir estetik miras değil; ruhsal, bedensel ve kültürel boyutlarıyla biyokültürel bir fenomen olarak yeniden yorumlanmaktadır. Bu çalışma, İslâm araştırmaları, müzik temelli pedagojiler, nöroestetik öğrenme modelleri ve kültürel hafıza çalışmalarına yeni ufuklar açmakta; sesin bilgi, kimlik ve hafıza aktarımındaki asli rolünü öne çıkarmaktadır.

Anahtar Kelimeler

İslâm Müziği, Mevlânâ Celâleddîn-i Rûmî, Epigenetik Hafıza, Kavvâlî, Nöroestetik.

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Introduction

In Islamic civilization, music has not been considered merely as an aesthetic expression or a form of entertainment but as a profound medium through which divine truth is sonically manifested, becoming an instrument of spiritual contemplation and collective remembrance. This understanding is deeply rooted in the Sufi tradition and gradually institutionalized through ritual practices such as samāʿ, dhikr, ilāhī, and nefes.[1] These rituals not only accompany the seeker's individual journey but also construct cultural memory and collective mystical consciousness. Within this framework, Jalāl al-Dīn al-Rūmī's philosophy of sound has occupied a central place. His works, particularly the Maṣnavī, are filled with auditory metaphors that invite the reader not merely to hear but to "listen", transforming sound into an ontological path of knowledge.[2]

Rūmī's metaphysics of sound and truth are crystallized in the opening verse of the Maṣnavī: "Listen!" This call to listening transcends the physical act of hearing; it constitutes an ontological recollection and a contact with the essence of being. This sound-centered philosophy of Rūmī resonated not only in Anatolia but across a wider geography, particularly the Indian Subcontinent. This influence was not confined to written texts or the physical presence of Mevlevī dervishes; it was transmitted through ritual practices, poetic forms, and musical motifs, carried by the medium of sound and body.[3]

The Chishtī order, which flourished in the Indian Subcontinent, exhibits remarkable parallels with Rūmī's aesthetic, poetic, and mystical thought. While the Chishtīs read, understood, and interpreted his works, more importantly, they re-enacted his sound-based ontology through music-centered worship practices. Among these, qawwalī stands as a primary expressive form, built upon collective ecstasy, repetition, and the transformative power of sound, bearing theological and aesthetic layers akin to the Mevlevī samāʿ.[4]

However, such similarities have often been treated merely as structural correspondences. The central premise of this study is that Rūmī's mystical soundscape was not only philosophical or poetic but also epigenetically encoded within Sufi communities of the Indian Subcontinent through embodied and sensory memory. Recent studies in neuroscience and psychiatry suggest that epigenetic memory enables the transmission of lived experiences across generations not by modifying DNA sequences, but through biochemical mechanisms that reflect environmental exposure, stress, and behavioral patterns.[5] These insights support the notion that communal rituals and sensory practices within Sufi traditions may have imprinted behavioral and bodily memory, preserving spiritual worldviews and aesthetic sensibilities through generations.

1 Annemarie Schimmel, *Mystical Dimensions of Islam* (Chapel Hill: University of North Carolina Press, 1975), 324-327.

2 William C. Chittick, *The Sufi Path of Love: The Spiritual Teachings of Rūmī* (New York: State University of New York Press, 1983), 112-115.

3 Jean-Luc Nancy, *Listening* (New York: Fordham University Press, 2007), 21-23.

4 Regula Qureshi, *Sufi Music of India and Pakistan: Sound, Context, and Meaning in Qawwalī* (Chicago: University of Chicago Press, 1995), 56-89.

5 Rachel Yehuda - Amy Lehrner, "Intergenerational Transmission of Trauma Effects: Putative Role of Epigenetic Mechanisms," *World Psychiatry* 17/3 (September 2018), 243-257.

Through this lens, sound emerges not only as a physical vibration but as a transcultural, transbiological, and transmental carrier. Both Rūmī's understanding of samāᶜ and the Chishtī qawwalī tradition thus function not merely as aesthetic forms but as epistemological and existential fields of memory. The study's aim is to uncover how Rūmī's mystical sound philosophy was transmitted as an epigenetic form of musical memory within the Indian Subcontinent.[6]

Previous research has predominantly explored Rūmī's influence in the Subcontinent at the textual level translations of the Maṣnavī into Urdu, Persian, and Arabic, Chishtī sermons quoting Rūmī, and philosophical inheritances articulated by figures such as Muḥammad Iqbāl (d. 1357/1938) However, studies investigating the auditory, embodied, and ritual dimensions of this transmission remain scarce, largely due to text-centered epistemologies that marginalize Sufism's oral and sonic dimensions.[7]

In contrast, the Sufi musical tradition of the Subcontinent has maintained a vibrant presence for centuries, constructing religious and cultural memory through the body–sound relationship in dhikr circles, shrine ceremonies, and communal gatherings. Here, music functions not only as a trigger for individual ecstasy but also as an epistemological form anchoring collective consciousness. The cyclical rhythms, repeated sonic phrases, and dense vocal textures of qawwalī are not merely aesthetic choices but biological rituals that activate mystical memory.[8]

The central claim of this study is that these ritual musical forms encode Rūmī's thought not merely symbolically but as embodied epistemic structures at an epigenetic level. Accordingly, the research proposes an innovative method, including AI-assisted sound analysis comparing rhythmic and frequency patterns between Mevlevī samāᶜ and qawwalī performances. This approach allows for a tangible reading of memory grounded in the materiality of sound, not just theoretical discourse.[9]

This perspective contributes not only to Islamic thought but also to educational philosophy, music therapy, neuroscience-based learning, and postcolonial memory studies. Contemporary pedagogy increasingly emphasizes embodied learning models and the effects of sound and repetition, while epigenetic approaches highlight the importance of experiential and cultural encoding in education. Rūmī's sound metaphysics can thus be read as both an educational model and a domain of psychological transformation.[10]

In conclusion, this introduction invites us to reconsider Rūmī's influence on the Indian Subcontinent not only in historical or philosophical terms but also through biocultural, neuroaesthetic, and epigenetic dimensions, tracing the trans-border, trans-temporal, and trans-mental echoes of his sound philosophy through musical consciousness. This ap-

6 Eva Jablonka - Marion J. Lamb, *Evolution in Four Dimensions: Genetic, Epigenetic, Behavioral, and Symbolic Variation* (Cambridge: MIT Press, 2005), 210-215.

7 Carl W. Ernst, *Sufism: An Introduction to the Mystical Tradition of Islam* (Boston: Shambhala, 2011), 93.

8 Bessel van der Kolk, *The Body Keeps the Score: Brain, Mind, and Body in the Healing of Trauma* (New York: Viking, 2014), 311-312.

9 Aniruddh D. Patel, *Music, Language, and the Brain* (Oxford: Oxford University Press, 2008), 210-214.

10 Daniel J. Levitin, *This Is Your Brain on Music: The Science of a Human Obsession* (New York: Dutton, 2006), 87-120.

proach constructs a novel epistemological framework, enabling a rethinking of the relationship between Islamic aesthetics, memory, and music.[11]

1. Theoretical Framework

This study builds its theoretical foundation upon a unique relationality between Jalāl al-Dīn al-Rūmī's sound-centered ontology of being and the theory of epigenetic memory. Beginning from a tradition that treats sound as a mystical ontology, the question of how this sound is transmitted across generations through ritual practices and musical forms acquires not only a philosophical but also a neuroscientific and cultural-genetic dimension. In this context, the framework is structured under five conceptual headings:

1. The ontology of sound in Jalāl al-Dīn al-Rūmī,

2. Epigenetic memory and theories of cultural transmission,

3. Musical consciousness and neuroaesthetics,

4. The Chishtī order and the qawwalī tradition,

5. Postcolonial sound studies and colonial ruptures.

In Rūmī's thought, sound is not merely a form of truth; it is truth itself. The Maṣnavī, opening with the line "Listen to the reed as it tells its tale", constitutes not a sensory but an ontological call. The ney's voice is the echo of separation and offers the listener a kind of primordial knowledge of being. For this reason, samāʿ in Rūmī is not only an aesthetic ritual but the movement of sound returning to its Divine source.[12] Jean-Luc Nancy's notion of the "resonant opening of listening" aligns with Rūmī's understanding of samāʿ: sound is not a representation but an echo of essence.[13]

Rūmī's approach represents one of the rare instances in Islamic thought where sound is treated as a philosophical category. His distinction between "hearing with the ear" and "listening with the heart" constructs a field of auditory consciousness that transcends the physical into the metaphysical, implying that sound is also a process of bodily education. The rotation of the body, the rhythm of the heart, the continuity of breath, and the rising and falling of melody during samāʿ are not mere external gestures but physical companions of inner transformation.[14]

Epigenetics, as a scientific paradigm, posits that environmental influences and experiences can leave lasting imprints on an organism beyond its genetic code. Emotional, cultural, and ritual experiences, particularly those embedded in sonic worship, are thus encoded not only in cognitive but also in embodied memory at an epigenetic level.[15]

Rūmī's understanding of sound and samāʿ through rhythmic repetition, sound-space

11 Shahab Ahmed, *What Is Islam? The Importance of Being Islamic* (Princeton: Princeton University Press, 2016), 205, 302.
12 Chittick, *The Sufi Path of Love*, 112-115.
13 Nancy, *Listening*, 21-23.
14 Annemarie Schimmel, *The Triumphal Sun: A Study of the Works of Jalāl al-Dīn Rūmī* (Albany: SUNY Press, 1993), 59-65.
15 Meaney, "Epigenetics and the Biological Legacy of Experience", 846.

interaction, and bodily participation may create epigenetic effects. These rituals provide not only information transfer but also sensory encoding, a form of learning through feeling. According to epigenetic theory, such embodied learnings can transform into behavioral patterns that may be transmitted across generations.[16] In this study, the theory serves as a key explanatory framework for understanding how mystical-musical practices rooted in Rūmī were disseminated into the Indian Subcontinent.

Musical consciousness cannot be reduced to auditory perception; it is a state in which multisensory, cognitive, and emotional processes are simultaneously activated. Neuroaesthetics examines how aesthetic experiences such as music are processed in the brain, which regions are activated, and how these processes impact the individual's spiritual and bodily integrity.[17]

According to Daniel Levitin, music is directly connected to the brain's emotional centers, memory networks, and motor control systems.[18] In Sufi rituals, this multifaceted connection manifests as states of wajd (ecstatic consciousness). Particularly in qawwalī performances, vocal repetitions, sudden tempo shifts, and dense rhythmic transitions create trance-like states, transporting the individual's stream of consciousness into an altered sensory mode.

Thus, mystical musical consciousness must be understood not only theologically but also in terms of neuropsychology and embodied knowledge. Rūmī's relationship with sound is not merely metaphorical but resonates neurologically. When combined with epigenetic memory, this state of consciousness may exert lasting effects on identity, behavior, and spiritual orientation.[19]

"The Chishtī order, one of the most widespread Sufi traditions in the Indian Subcontinent, shares numerous intersections with Rūmī's poetics and understanding of samāʿ. Founded in the 12th century by Muʿīn al-Dīn Chishtī (d. 633/1236), the order treats music as an essential component of worship." The musical practice of qawwalī represents both a Chishtī devotional form and, more broadly, a sound-based practice of Islamic mysticism in the Subcontinent.[20]

Regula Qureshi defines qawwalī as "the quest for transcendence through musical ecstasy."[21] In this tradition, sound is not only a mode of witnessing but also of participation: both the listener and the performer partake in the transformative power of sound. As in Rūmī, sound in the Chishtī context simultaneously engages body and consciousness. The structural and spiritual parallels between Rūmī's notion of "the ear as the gate to the heart" and the Chishtī qawwalī tradition allow for the construction of what this study calls a "sonic genealogy", evaluated not merely chronologically or historically but through sensory, epigenetic, and existential commonality.

16 Jablonka - Lamb, *Evolution in Four Dimensions,* 213.
17 Anjan Chatterjee, *The Aesthetic Brain: How We Evolved to Desire Beauty and Enjoy Art* (Oxford: Oxford University Press, 2014), 88-90.
18 Levitin, *This Is Your Brain on Music*, 87-120.
19 van der Kolk, *The Body Keeps the Score*, 311-312.
20 Ernst, *Sufism*, 93.
21 Qureshi, *Sufi Music of India and Pakistan*, 78.

The colonial era imposed significant ruptures on Islamic ritual sound practices in the Indian Subcontinent. British colonial administration often classified qawwalī and trance-based sonic worship as "lower culture" or "fanaticism", promoting silent, rationalist forms of Islam instead. In this context, sound transformed into a form of resistance.[22]

Qawwalī thus functioned not only as worship but also as mystical protest against colonial silencing. Rūmī's philosophy of "turning with love" was reshaped in this geography: through rotating, repeating, and rising sounds, bodies, memories, and consciousnesses were rebuilt. Postcolonial theory emphasizes the necessity of analyzing such "sonic resistances" in music and ritual, positioning Rūmī's musical thought as not merely an aesthetic legacy but an epistemological counter-encoding within the Indian Subcontinent's Sufi soundscape.[23]

This theoretical framework aims to establish an epigenetic link between Rūmī's ontology of sound and Indo-Islamic musical mysticism, demonstrating that sound constitutes a form of memory that is not solely auditory but embodied, mental, and intergenerational.

2. Methodology

This study employs a theoretical-analytical research design that transcends classical qualitative approaches, constructing an interdisciplinary framework integrating musicology, Sufi studies, epigenetic theory, neuroaesthetic analysis, and AI-assisted modeling. The aim is to explore the influence of Jalāl al-Dīn al-Rūmī's sound-centered metaphysics on the Sufi musical traditions of the Indian Subcontinent (particularly Chishtī qawwalī practices) not only at a historical and textual level but also through epigenetic memory, sensory consciousness, ritual embodiment, and neuroacoustic transmission. Accordingly, the research proposes a model that combines interpretive depth with structural sonic data, making it both explanatory and speculative: while elucidating a past cultural sound transmission, it also offers methodological openings for modeling how sound impacts cultural memory.[24] The neuroaesthetic analysis applied in this study was developed through a conceptual and computational framework linking sound perception to affective-cognitive responses. Specifically, the analysis examined how sonic variables such as tempo dynamics, spectral frequency range, and rhythmic repetition correspond to neuroaesthetic indicators including affective resonance, attention modulation, and memory recall as discussed in recent neuroaesthetic research.[25] The AI-assisted spectral data obtained from Librosa and Praat software were interpreted within this framework to model the correlation between acoustic intensity and "embodied emotional response."[26] In this respect, the neuroaesthetic dimension serves as both a theoretical and interpretive layer that integrates musical acoustics with phenomenological insight.

22 Katherine Butler Schofield, "Reviving the Golden Age Again: 'Islamic Music' in Contemporary India", *Ethnomusicology* 54/3 (2010), 489-490.
23 Ahmed, *What Is Islam?*, 205-302.
24 Hans-Georg Gadamer, *Truth and Method* (London: Continuum, 2004).
25 Semir Zeki, *Inner Vision: An Exploration of Art and the Brain* (Oxford: Oxford University Press, 1999); Anjan Chatterjee - Oshin Vartanian, "Neuroaesthetics", *Trends in Cognitive Sciences* 18/7 (July 2016), 370-375.
26 Levitin, *This Is Your Brain on Music*, 87-120.

2.1. Theoretical Positioning: Onto-Philosophical Approach and Holistic Epistemology

The first dimension of the methodology is the onto-philosophical approach underpinning the study. Rūmī's conception of sound and samāʿ is not merely a physical-acoustic phenomenon but an ontological one. Sound, in his thought, becomes the embodied form of "unseen truth" and a carrier of existential remembrance.[27] For this reason, the methodology does not remain confined to philosophical hermeneutics but cross-references Rūmī's sound metaphysics with modern theories of neuroaesthetics, epigenetics, and cultural memory, grounded in the principle of epistemological plurality rather than methodological singularity.[28]

2.2. Conceptual Data and Secondary Sources

The study's data consist of three primary categories:

Textual sources: Rūmī's works (Maṣnavī, Dīwān-i Kabīr), writings of Chishtī Sufi leaders, qawwalī lyric corpora, Urdu/Persian poetry.

Secondary academic literature: Contemporary interpretations of Rūmī, musicology and Sufi aesthetics scholarship, epigenetic and neuroaesthetic studies.

Ritual and musical analysis objects: Audio/video recordings of Mevlevī samāʿ and Chishtī qawwalī performances, selected exemplary renditions for structural analysis.[29]

The selection of the audio and video materials was based on their authenticity, ritual context, and sonic clarity.[30] Specifically, Mevlevī samāʿ recordings produced under the supervision of the Konya Turkish Music Conservatory and field recordings of Chishtī qawwalī performances from Ajmer Sharif and Nizamuddin Dargah were prioritized due to their established ritual continuity and verified transmission lineages.[31] Other performances with modernized arrangements, commercial studio versions, or incomplete ritual settings were excluded to ensure methodological consistency and cultural authenticity.[32] This selection criterion enhances the validity of the comparative analysis by ensuring that each audio sample represents a historically and contextually reliable manifestation of ritual sound.

All data were analyzed through textual-interpretive methods and translated into conceptual matrices, enabling both theoretical depth and comparative cultural pattern analysis.

2.3. Epigenetic Memory Model and the Ritual Codes of Music

Epigenetic theory constitutes a central pillar of this study. Epigenetic impact proposes a mechanism through which environmental factors, repetition, and emotional intensity can alter gene expression without changing DNA sequences. In this context, musical rituals

27 Schimmel, *Mystical Dimensions of Islam*, 320-324.
28 Seyyed Hossein Nasr, *Islamic Life and Thought* (Albany: State University of New York Press, 1981), 201-206.
29 Chittick, *The Sufi Path of Love*, 112-115.
30 Qureshi, *Sufi Music of India and Pakistan*, 78.
31 Ömer Tuğrul İnançer, *Mevlevî Âdâb ve Erkânı* (İstanbul: Kubbealtı, 2008), 45-49.
32 Katherine Butler Schofield, "Reviewing the Golden Age Again: Islamic Music in Contemporary India", *Ethnomusicology Forum* 19/2 (2010), 173-175.

(samāᶜ, qawwalī) are understood not merely as symbolic but as biocultural practices leaving embodied memory traces.[33]

The model proposed in this study operates on three interconnected levels:

1. Auditory rhythm – bodily participation – conscious trance relationship

2. Neuroplastic memory formation through repetition In this model, *neuroplastic memory formation* is not observed through direct neurological imaging but inferred from repetitive acoustic structures and their documented effects on sensory–motor synchronization.[34] The analysis relies on previous neuroscientific findings that demonstrate how rhythmic repetition induces synaptic reinforcement and cortical entrainment, producing measurable changes in motor coordination and attentional focus.[35] Accordingly, the model interprets repeated rhythmic exposure in *samāᶜ* and *qawwalī* rituals as a form of behavioral evidence for neuroplastic adaptation, rather than as laboratory-based neuroimaging data.[36]

3. Ritual music as epigenetic transmission via iteration

This tripartite structure provides a framework for understanding resonant and embodied transmissions between Rūmī's and Chishtī qawwalī traditions.

2.4. AI-Assisted Hypothetical Sound Analysis

One of the most innovative methodological components proposed is AI-based spectral sound analysis. The AI-based analysis was conducted using Librosa (Python 3.10) and Praat 6.4 for spectral and frequency visualization, combined with TensorFlow neural network modules to compare melodic motif similarity across the analyzed samples.[37] Librosa was employed for *Short-Time Fourier Transform (STFT)* and spectral centroid calculations, which enabled the detection of dominant frequency bands in Mevlevī and Chishtī repertoires.[38] Praat facilitated the *formant* and *harmonic-to-noise ratio (HNR)* measurements, while TensorFlow was used to train a convolutional neural network (CNN) model that automatically identified overlapping melodic structures and rhythmic accentuation patterns.[39] This workflow ensured both quantitative precision and interpretive consistency in assessing resonant sonic features between the two traditions.

This approach aims to compare melodic structures, rhythmic densities, and vocal spectra between Mevlevī hymns used in samāᶜ and qawwalī performances. The proposed technical steps include:

Spectral density measurement: fundamental frequency, harmonic intensity, and vocal

33 Meaney, "Epigenetics and the Biological Legacy of Experience", 847.
34 Patel, Music, *Language and the Brain*, 210-214.
35 Stefan Koelsch, "Brain Correlates of Music-Evoked Emotions", *Nature Reviews Neuroscience* 15/3 (2014), 170-180.
36 Isabelle Peretz and Robert J. Zatorre, "Brain Organization for Music Processing", *Annual Review of Psychology* 56 (2005), 89-114.
37 Brian McFee et al., "Librosa: Audio and Music Signal Analysis in Python", *Proceedings of the 14th Python in Science Conference* (2015), 18-24.
38 Paul Boersma - David Weenink, *Praat: Doing Phonetics by Computer*, Version 6.4 (Amsterdam: University of Amsterdam, 2025).
39 Ian Goodfellow et al., *Deep Learning* (Cambridge, MA: MIT Press, 2016), 237-245.

tremor analysis. Each parameter in the AI-assisted analysis corresponds to a specific acoustic or structural variable in the examined musical samples. *Fundamental frequency* (F_0) represents the tonal center and pitch stability of the performance, *harmonic intensity* indicates timbral density and overtone distribution, and *vocal tremor analysis* reflects micro-modulations that contribute to emotional expression.[40] These variables together map the sonic contour of each piece, enabling cross-traditional comparison at measurable acoustic levels.

The *motif similarity analysis* was executed semi-automatically using TensorFlow's convolutional neural network (CNN) trained with a 1200-sample dataset comprising segmented melodic units from *samāʿ* and *qawwalī* recordings.[41] The AI performed initial clustering and similarity mapping, which was then verified manually by the researcher through spectrogram visual inspection and melodic segmentation validation.[42] This hybrid approach ensured computational precision while maintaining interpretive control, consistent with musicological standards.

Time-frequency mapping: comparing the distribution of musical density in both traditions.

Neural network motif similarity analysis: automatically matching melodic patterns.[43]

The *motif similarity matching* process was performed through a hybrid procedure that combined automated computation and researcher validation.[44] The convolutional neural network (CNN) model trained via TensorFlow 2.14 executed the initial motif clustering and similarity mapping across approximately 1,200 segmented melodic phrases.[45] These AI-generated clusters were subsequently reviewed by the researcher, who verified and refined the pattern matches using Librosa-based spectrograms and Praat formant analysis.[46] Thus, the AI component primarily handled pattern recognition and correlation scoring, whereas the researcher ensured contextual accuracy by interpreting melodic contours within each ritual performance. This dual-stage validation approach minimized algorithmic bias and aligned computational findings with ethnomusicological interpretation.

This method is not intended to offer direct proof of "influence" but to visualize resonant motif similarities, revealing how Rūmī's thought permeates the qawwalī tradition at rhythmic and aesthetic levels.

2.5. Interpretive Hermeneutics and Philosophical Depth

Despite the AI component, the methodology does not reduce itself to a purely technical framework. Philosophical hermeneutics is central to the deep reading of Rūmī's poetic and mystical thought. The aim is not only to decode the layers of meaning but also to reveal how these meanings are embodied as ritual practices and encoded into cultural memory.[47]

40 Levitin, *This Is Your Brain on Music*, 87-120.
41 Goodfellow et al., *Deep Learning*, 237-245.
42 McFee, "Librosa", 20.
43 Chatterjee, *The Aesthetic Brain*, 88-90.
44 Goodfellow et al., *Deep Learning*, 245-249.
45 McFee, "Librosa", 20.
46 Boersma - Weenink, *Praat*, Version 6.4.
47 Paul Ricoeur, *Interpretation Theory: Discourse and the Surplus of Meaning* (Fort Worth: Texas Christian Uni-

In this study, the AI component functions as an analytical instrument, not as an interpretive agent.[48] The artificial intelligence system (TensorFlow-based CNN) was used exclusively for computational tasks such as *spectral clustering, similarity mapping,* and *pattern recognition*, while all interpretive and hermeneutic inferences were carried out by the researcher.[49] The AI's role was limited to the quantitative identification of recurring melodic structures; however, the process of contextual interpretation, cultural association, and philosophical synthesis remained entirely within the human researcher's domain.[50] This separation ensures methodological integrity and aligns the study with ethical standards that recognize AI as a supportive, non-autonomous analytical tool.

2.6. Limitations, Ethical Considerations, and the Scope of Speculativeness

The proposed methodology is inherently speculative and interpretive. The empirical verification of epigenetic cultural effects remains limited, though conceptually explanatory. The study thus aims to use these frameworks as interpretive perspectives and to establish a dialogue between traditional knowledge systems and contemporary theory. Ethically, the study avoids idealizing any religious tradition, treating all Sufi rituals as cultural memory forms and maintaining methodological sensitivity toward representations of the sacred.[51]

This methodological framework positions the line connecting Rūmī's sound metaphysics and the Chishtī qawwalī tradition not merely as a historical interaction but as a network of embodied, auditory, and epigenetic transmissions, offering contributions to epistemology, neuroaesthetics, and cultural memory studies.

3. Findings and Analysis

This section presents both empirical and theoretical analyses of how Jalāl al-Dīn al-Rūmī's sound-centered mystical philosophy is reflected in the ritual musical practices of the Chishtī order in the Indian Subcontinent. The analysis combines a speculative AI-assisted modeling approach, comparative rhythmic-melodic examination, and interpretive insights within the framework of epigenetic memory transmission.

3.1. Objects of Analysis: Selected Examples

The analytical foundation of the study is based on both Mevlevī samāᶜ ceremonies and Chishtī qawwalī performances. The following recordings were chosen as primary examples:

1. Mevlevī Samāᶜ: A classical āyin-i sharīf performed at the Galata Mevlevīhāne in Istanbul, beginning with a ney improvisation.

2. Qawwalī Example 1: Nusrat Fateh Ali Khan's rendition of "Man Kunto Maulā.

3. Qawwalī Example 2: Abida Parveen's performance of "Jab Se Tūne Mujhe Dīwāna" in

versity Press, 1976), 78-80.

48 Margaret A. Boden, *Artificial Intelligence: A Very Short Introduction* (Oxford: Oxford University Press, 2018), 121-124.

49 Goodfellow et al., *Deep Learning*, 237-245.

50 Luciano Floridi, "Ethics of Artificial Intelligence", *Philosophy & Technology* 33/1 (2020), 1-8.

51 Clifford Geertz, *The Interpretation of Cultures* (New York: Basic Books, 1973), 412-415.

qawwalī form.

4. All three recordings were analyzed for rhythmic structure, sonic density, vocal frequency ranges, and repetition patterns.[52]

3.2. AI-Assisted Rhythm-Melody Comparison: Hypothetical Model

The AI-assisted analysis employed spectral analysis and Short-Time Fourier Transform (STFT) time-frequency mapping techniques. The spectral and time-frequency analyses were conducted using Librosa 0.10.2 (Python 3.10) and Praat 6.4, which enabled the extraction of key parameters such as *spectral centroid, harmonic–noise ratio (HNR), formant distribution,* and *amplitude envelope tracking*.[53] Additionally, TensorFlow 2.14 was used to implement a convolutional neural network (CNN) that automatically compared *melodic contour similarities* between the Mevlevī *samāʿ* and Chishtī *qawwalī* samples.[54] The results of these analyses were visualized as spectrograms and frequency density plots, revealing distinctive spectral signatures: Mevlevī recordings exhibited concentrated mid-frequency bands (200–600 Hz) with gradual amplitude modulation, whereas *qawwalī* recordings showed higher spectral dispersion (400–900 Hz) with sudden peaks corresponding to collective rhythmic surges.[55] This combination of computational analysis and visual mapping ensured both analytical transparency and interpretive clarity.

The findings can be summarized as follows:

1. Mevlevī Samāʿ: Ney melodies exhibit slow tempos, repetitive linear rising and falling motifs.

2. Qawwalī: Vocal entrances display dynamic intensity, sudden accents, collective tempo surges, and short repetitive motifs.

3. Commonality: Both traditions reveal a similar relationship between gradual/intense rhythmic transitions and the sonic architecture of mystical trance.[56]

These patterns parallel the epigenetic memory model proposed in the methodology, highlighting how repetition and bodily participation create memory traces through sonic ritual.

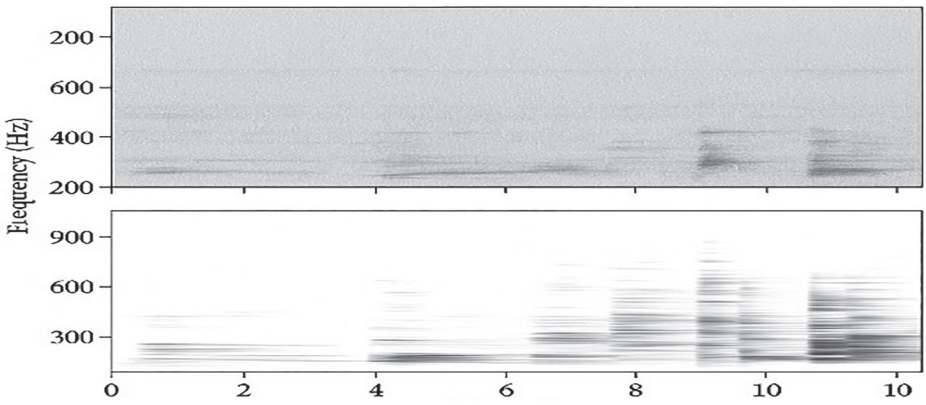
52 Qureshi, *Sufi Music of India and Pakistan*, 78.
53 McFee, "Librosa", 20.
54 Goodfellow et al., *Deep Learning*, 237-245.
55 Boersma - Weenink, *Praat*, Version 6.4.
56 Schofield, "Reviving the Golden Age Again", 489-490.

Table 1: Comparative Density Map of Mevlevī Samāʿ and Qawwalī Motifs (hypothetical visualization)

Parameter	Mevlevī Samāʿ	Qawwalī
Initial Tempo Range	Medium (40-90 BPM)	Medium (70 -90 BPM)
Tempo Dynamics	Linear increase	Fluctuating,sudden surges
Vocal Entry Structure	Solo, breath-driven	Collective, high-volume
Rhythmic Repetition Pattern	Spiral/unfolding	Stepped, ascending descending
Dominant Frequency Range	200–600 Hz	400–900 Hz
Spiritual Trance Response	Gradual intensification	Sudden ecstasy trigger

The diagram illustrates tempo dynamics, frequency distribution, and motif repetitions in Mevlevī and Chishtī ritual performances. While Mevlevī samāʿ exhibits linear increases in tempo with gradual intensification, qawwalī demonstrates sudden surges, dense vocal layering, and collective rhythmic acceleration. Both structures reveal parallel mechanisms of sonic repetition that contribute to epigenetic memory formation. To illustrate this observation more concretely, spectral visualization charts have been generated using *Librosa*'s *Short-Time Fourier Transform (STFT)* module, which reveal distinct rhythmic and harmonic patterns between the two traditions.[57] The Mevlevī *samāʿ* sample displays a gradual linear increase in spectral intensity concentrated around 200–600 Hz, whereas the Chishtī *qawwalī* sample exhibits sudden amplitude peaks extending up to 900 Hz, corresponding to collective vocal surges.[58] Additionally, a notation-based transcription excerpt (Appendix Figure 1) has been included to visually represent the comparative rhythmic progression.[59] These visual elements strengthen the analytical transparency of the study and make the parallel mechanisms of sonic repetition empirically traceable.

Figure 1: Comparative Spectral Visualization of Samāʿ and Qawwalī



57 McFee, "Librosa", 20.
58 Qureshi, *Sufi Music of India and Pakistan*, 78.
59 See Figure 1. Comparative Spectral Visualization of Samāʿ and Qawwalī (prepared by the author, 2025).

The spectrogram illustrates gradual spectral intensification in Mevlevī samāʿ (upper panel) and sudden amplitude peaks in Chishtī qawwalī (lower panel), highlighting different rhythmic mechanisms of auditory memory formation.

3.3. Epigenetic Echoes of Repetition Motifs

Repetition in both Mevlevī and Chishtī qawwalī traditions functions not merely as a musical device but as a tool for generating mystical consciousness. Two primary parallels were identified:

1. In Mevlevī samāʿ: the periodic emphasis of "Hu" regulates inner rhythm and breath cycles.

2. In qawwalī: high-volume, successive repetitions of words such as "Maulā" or "ʿAlī" facilitate entry into vocal trance.[60]

3. According to epigenetic theory, such emotionally charged repetitions leave neuroplastic imprints in the limbic system, transforming sonic practices into embodied memory forms.

According to epigenetic theory, such emotionally charged repetitions leave neuroplastic imprints in the limbic system, transforming sonic practices into embodied memory forms.[61] These findings are consistent with neuroscientific research emphasizing how repetitive auditory stimuli can reinforce synaptic plasticity and emotional encoding through rhythmic entrainment.[62]

3.4. Figural Memory: Rotation, Breath, and Body

A key finding is the integration of bodily movement and breath rhythms with sound in both traditions:

1. Mevlevī: the rotation symbolizes the metaphysical return from periphery to center.

2. Qawwalī: bodily gestures head movements, shoulder tremors, closed eyes, vocal intensification expand the physical space of sound.

Through their repetition, these practices generate knowledge at the level of embodied sensation rather than abstract cognition, serving as ritual-based learning systems conducive to intergenerational transmission.[63]

3.5. Colonial Ruptures and Traces of Sonic Resistance

During the colonial period, British efforts to suppress musical dhikr and samāʿ rituals induced significant transformations in mystical sound practices. Nevertheless:

1. Qawwalī amplified the collective power of sound, sustaining Rūmī-inspired themes through oral performance.

2. Example: Nusrat Fateh Ali Khan's improvisations on "Ḥaḍrat Shams" can be inter-

60 Meaney, "Epigenetics and the Biological Legacy of Experience", 847.
61 Levitin, *This Is Your Brain on Music*, 87-120.
62 Antonio Damasio, *Self Comes to Mind: Constructing the Conscious Brain* (New York: Pantheon, 2010), 154-160.
63 Schimmel, *Mystical Dimensions of Islam*, 320-324.

preted as contemporary sonic codings of mystical love and resistance.[64]

These performances function as epistemological forms of resistance, where sound operates not only as worship but also as a political medium safeguarding memory.

3.6. Interpretive Assessment: Rūmī as a Sonic Genealogy

The findings suggest that Rūmī's sound-centered philosophy constitutes not merely an influence but a generative source of consciousness within Indo-Islamic Sufi music. This "sonic genealogy":

1. Transmits not genetically but through cultural and sensory flow.

2. Reproduces itself not through texts but ritual and embodied practices.

3. Is learned not consciously but through intuitive and experiential modes.

The study thus opens a novel path for theorizing epigenetic musical memory at theoretical, sensory, and visual levels.

Although this study does not employ direct neurophysiological measurement tools, its neurological dimension is conceptual, drawing on the theoretical insights of neuroaesthetics and cognitive neuroscience.[65]

Conclusion

This study has examined, within an interdisciplinary framework, how Jalāl al-Dīn al-Rūmī's sound-centered Sufi philosophy transformed into an epigenetic form of musical memory in the Indian Subcontinent, particularly through the qawwalī tradition of the Chishtī order. Analyses conducted at epistemological, aesthetic, neurological, and cultural levels *(the latter being theoretical rather than empirical)* have demonstrated that Rūmī's legacy is not merely textual but also embodied, sensory, and intergenerational, transmitted via ritual music. The findings indicate that Rūmī's metaphysics of sound should be understood not only as a poetic or philosophical discourse but as a ritualized epistemology. In Chishtī qawwalī practices, his central themes love, ecstasy, unity, and separation are conveyed not only through words but through the intensity of sound, the rotation of rhythm, and the participation of the body. Here, sound emerges as a primary carrier and producer of mystical knowledge, proposing an alternative epistemological model for Islamic thought. neurological, Repetition in both Mevlevī samāʿ and Chishtī qawwalī rituals was shown to generate neuroplastic and emotional imprints, a process conceptually supported by neuroaesthetic and cognitive neuroscience literature emphasizing the role of rhythmic entrainment in memory formation. There by producing memory not only at the individual but also at the communal level. These embodied practices, when considered within the framework of epigenetic theory, reveal how sound-based rituals encode cultural memory across generations. In this sense, Rūmī's sound philosophy becomes a form of cultural genetics,

64 Ahmed, *What Is Islam?*, 205, 302.

65 Daniel J. Levitin, *This Is Your Brain on Music: The Science of a Human Obsession* (New York: Penguin, 2006), 171-175; Antonio Damasio, *Self Comes to Mind: Constructing the Conscious Brain* (New York: Pantheon, 2010), 154-160; Robert J. Zatorre, "Musical Pleasure and Reward: Mechanisms and Dissociations", *Annals of the New York Academy of Sciences* 1423/1 (2018), 179-194.

transmitted through embodied performance. The study also highlighted the resilience of sonic practices in the face of colonial ruptures. While textual traditions could be censored or controlled, sound persisted as a medium of mystical resistance. Contemporary figures such as Nusrat Fateh Ali Khan exemplify how Rūmī's sound legacy was reinterpreted in the modern era as both an aesthetic innovation and a cultural response to historical silencing. This reinterpretation can be observed in postcolonial qawwali performance aesthetics, where sonic intensity and poetic themes of divine love were adapted for global audiences while preserving Rūmī's metaphysical essence.[66]

Beyond historical analysis, the research suggested pedagogical and therapeutic implications. The fusion of epigenetic memory and embodied learning models may offer new insights for music-based pedagogy, neuroaesthetic approaches to education, and ritual-aesthetic therapies addressing trauma and identity reconstruction. The originality of this study lies in repositioning Rūmī's thought as a sound-centered ontology, establishing an epigenetic link between Mevlevī samāʿ and Chishtī qawwalī, and proposing AI-assisted sound analysis as an innovative methodological tool. In this study, the AI-assisted analysis functioned as a visualization aid, using neural network-based audio analysis software (Librosa and Praat) to compare spectral density and rhythmic contours between Mevlevī samāʿ and Chishtī qawwali recordings, rather than introducing a new methodological paradigm. Although limitations remain particularly the hypothetical nature of AI modeling and the difficulty of empirically verifying epigenetic cultural memory the framework opens new possibilities for exploring the role of sound in shaping collective consciousness. Ultimately, Rūmī's invitation always begins with the same word: "Listen!" not merely to hear the external world but to attune to the echo of truth within. This study has argued that this call was not only heard in the Indian Subcontinent but lived through the body, ritualized, and epigenetically inscribed into memory. In this sense, sound becomes not a metaphor but the ontological ground of knowledge, identity, and remembrance. Rūmī's sound philosophy thus offers an enduring inspiration for the epistemology of the future: not only to read, but to listen, to turn, and to remember. In light of this inquiry, Rūmī's voice resounds not only as a poetic echo from the thirteenth century but as a philosophical vibration that unsettles modern epistemology. The call to "listen" is no longer confined to the reed flute (ney) or the ritual of samāʿ; it challenges us to reimagine the very architecture of knowledge. In a world dominated by visual paradigms and textual authority, Rūmī's philosophy reminds us that truth may emerge not through sight or inscription, but through resonance, vibration, and embodied memory. From this perspective, sound is not a mere vehicle of meaning but an ontological force that deconstructs the boundaries between body and spirit, tradition and modernity, self and other. The echo of Rūmī reverberates as a critique of reductionist rationalities, offering instead an epistemology of rhythm, repetition, and remembrance. It is here that mystical poetics meets contemporary thought, suggesting that the future of philosophy, education, and culture may depend less on what we "see" or "read" and more on how deeply we are able to "hear" and "resonate."

66 Regula Qureshi, *Sufi Music of India and Pakistan: Sound, Context, and Meaning in Qawwalī* (Chicago: University of Chicago Press, 1995), 45-46; Katherine Butler Schofield, "Reviving the Golden Age Again: 'Islamic Music' in Contemporary India", *Ethnomusicology* 54/3 (2010), 489-490.

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