ISSN 2618-1568 Vol. 7, Issue 3: 18-23, DOI: 10.25236/FAR.2025.070304

A Cultural Study of the Healing Acoustic Music of the Mass in Eastern Europe

Huaimin Ai

Belarus National University of Culture and Art, Minsk, Belarus
1322289668@qq.com

Abstract: *Based on the theories of cultural psychology and acoustic anthropology, and using audio spectral analysis, this study disciplinary methods such as in-depth interviews and fieldwork, found through experimental observation that the low-frequency sound waves of the Mass (100-400Hz for the base frequency and vocal parts) were significantly associated with the meaning of relaxation, while the high-frequency melody (2,000-4,000Hz) was correlated with the presentation of attention and emotional resonance. Data analysis based on the PANAS scale for grassroots believers showed a significant increase in the level of positive emotions after the ceremony (pre-M=2.8→post-M=4.2, $p<0.01$) and a significant alleviation of the level of negative emotions (pre-M=3.5→post-M=2.1, $p<0.01$). Textual content analysis revealed that more than 80% of the lyrics dealt with religious beliefs and historical memories, especially the reinforcement of cultural identity; the field survey showed that 90% of the fundamental believers agreed with the role of the Mass on the sense of cultural belonging. This study further suggests that low-frequency sound waves can be used as an adjunct to clinical treatment of anxiety disorders; high-frequency melodies can be used in attention deficit disorder laboratory clinical trials. The ideology of musical culture and the experience of the acoustic environment of churches may also be used as tools for group psychotherapy. Follow-up studies could build on this foundation by designing neuroimaging experiments to understand the interrelationship between musical activity and brain activity.*

Keywords: *cross-cultural studies, cultural psychology, anthropology of sound, music healing*

1. Background of the study

As an important part of the Eastern European religious music system, the Eastern European Mass has an irreplaceable role in rituals and ceremonies, as well as its significance for national identity, psychotherapy and social cohesion. There are not many in-depth studies of Orthodox music and its related genres, and there are indeed few studies that examine religious music from an interdisciplinary perspective. This has left a gap in the theoretical study of cultural psychology and acoustic anthropology, which this study seeks to fill.

2. Status of research

Music as a cultural symbol has the potential to stimulate emotional memory and cognitive schemata. Due to the close connection between historical events in Eastern Europe, it can activate empirical memory and cultural identity in believers; beliefs, historical memories, melodies, and hymns in religious music - phrases in Orthodox mass ritual music play a role in transmitting societal norms and values in order to strengthen an individual's cultural or religious identity. [1] As a form of psychotherapy, music therapy can be used as a catalyst to regulate a patient's emotional state and address emotional issues such as anxiety through the music's musicality and power to convey emotion. In short, ritual music can heal the soul.

It is clear that the acoustic phenomena in religious sound systems go far beyond ordinary musical elements and are essentially a system of cultural presentation carrying the semantics of faith. An example of this is the field of Slavic liturgical music, where the combination of compositional bees and textual connotations forms the basis of a dual culture: the central argument of the Orthodox theological system and the carrier of the civilisational memory of the Slavic peoples. [2] Theoretical studies on soundscapes offer an interdisciplinary research pathway through which it is possible to analyse the acoustic space of rituals and to disaggregate and theorise the complex auditory phenomena therein.

ISSN 2618-1568 Vol. 7, Issue 3: 18-23, DOI: 10.25236/FAR.2025.070304

Hymns circulated in religious complexes within the cultural fabric of Bulgaria and Serbia, creating an acoustic topology. Taking into account the age of the building, the quality of the stone and the dynamic sound sources generated during the rituals, the Byzantine dome structure style of the church space and the resonance properties of the stone form a sacred sound field. [3] This spatio-temporal acoustic environment serves a dual social function: firstly, it is a multi-sensory immersion experience that provides a psychological mechanism to promote faith identity; [4(]) secondly, it is an acoustic nexus for the resonance of group emotions, and the social integration of acoustic nexus can be detected in the yearly cycle of the liturgy, where the clergy relies on the yearly cycle of acoustic practices to maintain a sense of community amongst the believers Effect. Here we see the interdisciplinary value of soundscape theory. [5]

However, if we deconstruct the phenomenon of religious acoustics and construct a spiritual three-dimensional model of "environmental acoustics-psychological perception-cultural symbols", we can not only analyse the religious function of traditional ceremonial music, but also reveal the system of acoustic symbols and their structural role in the transmission of national culture. [5] This method of analysis provides a novel cognitive tool for dissecting the characteristics of the intangible cultural heritage of religious music in Eastern Europe.

3. Research methodology

It presents an interdisciplinary research framework that combines theories from cultural psychology and acoustic anthropology to provide a structural analysis of popular music in Eastern Europe through a variety of research methods including audio spectral analysis, textual analysis, in-depth interviews and fieldwork.

4. Data collection and analysis

4.1 Lyrics and sheet music for the Mass

The paper analyses and compares the Mass with Christian music by discussing various data, namely the lyrics and score of the Mass, lyrics, melodic and harmonic frequencies, pitch frequencies and rhythms, in order to present and demonstrate the uniqueness of the Mass.

4.2 In-depth interviews

Through face-to-face interviews in Eastern European churches, with respondents selected on the basis of 20 worshippers, the interviews were designed to cover in detail the musical characteristics, cultural significance and psychological impact of the Mass area, coded and categorised at the end of the interviews and statistically analysed to provide a breakthrough in the rural literature for religious personnel on the psycho-therapeutic function of the Mass.

4.3 Field investigations

Through fieldwork in representative Eastern European churches, such as the Simon and Helena Church, the Cathedral of the Holy Spirit, the Church of the Holy Trinity, and the All Saints' Memorial Church in Minsk, the function of the Mass in religious rituals was explained, and a multidimensional observation outline was designed to cover the ways in which the Mass was celebrated, the ways in which believers participated in the Mass, etc., and the content analysis method was adopted to analyse the process of performance and the participation in the religious rituals. The content analysis method was used to analyse the performance process and participation in the religious rituals, to code and classify the content of the observation records, and to provide some explanations of the function of the Mishnah in the religious rituals through statistical analysis.

4.4 Audio Spectrum Analysis

(1) Audio Capture

To capture the acoustic signals, we used an array of B-type microphones based on standard Orthodox sanctuaries, with the sampling parameters set to low or similar to the e EBU R128 broadcast standard, ensuring that the signal-to-noise characteristics captured were ≥96dB over the dynamic range.

ISSN 2618-1568 Vol. 7, Issue 3: 18-23, DOI: 10.25236/FAR.2025.070304

(2) Audio processing

The standardisation procedure includes spatial acoustic feature extraction, mono downmixing, curing of technical parameters (44.1kHz/16bit, CD quality standard) using an open source digital audio workstation, and ultimately optimisation of the multitrack mix,

(3) Configure the time-frequency window function:

Window divisions are performed with the help of Hanning's window, and the discrete unit is 256 samples.

(4) Fourier domain transform

Fast algorithms generate complex matrices containing amplitude and phase spectra: this is the conversion to the time-frequency domain. Among other things, the engineering application of Euler's formula ensures the mathematical integrity of the frequency domain resolution.

(5) Deconstructing the band by the numbers:

Monitoring for two prominent resonance bands

Ultimate Resonance Range (80-420 Hz): Nature and Physics Behind Choral Resonance and Harmony

(6) Adaptive filtering (pre "downconversion and filtering)

Let's use a wavelet threshold based denoising algorithm to remove the ambient noise background by spectral subtraction, a technical approach that can improve the signal-to-noise ratio of the target signal by more than 15 dB.

(7) Feature extraction: extract useful prudential features from the spectrogram, such as main frequency, frequency bandwidth, harmonic entities, etc., for subsequent processing

(8) Analysed in conjunction with the Positive and Negative Affect Scale (PANAS).

4.5 Analysis of results

The harmonic (100-400 Hz) component was associated with emotional relaxation and calming effects, and the melodic (2,000-4,000 Hz) component was associated with concentration and emotional resonance. Analyses of the PANAS data showed that the Eastern European Orthodox Mass chanting was performed 4 hours after the Mass chanting ceremony by 20 worshippers.

Positive and negative mood scores were calculated for each subject based on the collated data.

For the analyses, before and after mood scores were compared according to the paired samples t-test (paired samples t-test) and t-values and p-values were calculated: the results were calculated as follows Table 1:

Table 1: Eastern European Orthodox Mass Chanting: Pre-Post Ceremony Mood Scores Comparison (n=20)

point of time (in time-based systems)	M (mean)	SD (standard deviation)
funeral	3.5	0.6
post-ceremony	2.1	0.5

n = 20: n is the number of participants in the study, in this case 20 people

Standard deviation decreases: this means that the effect of mass on reducing negative emotions is generalised among respondents, rather than being effective for only a few people

Pre-SD = 0.6 Pre-data shows less variation in individual scores (more focussed data).

3 post rituals sd post = 0.5 This means that there is less individual variation (more accurate data).

Positive mood: mean of positive mood before the Mass chanting ceremony = 2.8, mean of positive mood after the Mass chanting ceremony = 4.2, $p<0.01$

$$t = \frac{M_{\text{post}} - M_{\text{pre}}}{\sqrt{\frac{SD_{\text{post}}^2 + SD_{\text{pre}}^2}{n}}}$$

.

ISSN 2618-1568 Vol. 7, Issue 3: 18-23, DOI: 10.25236/FAR.2025.070304

where pre-M = 2.8, post-M = 4.2, pre-SD = 0.5, post-SD = 0.6, and n = 20.

Calculations:

$$t = \frac{4.2 - 2.8}{\sqrt{\frac{0.5^2}{20} + \frac{0.6^2}{20}}} = \frac{1.4}{\sqrt{0.0125 + 0.018}} = \frac{1.4}{\sqrt{0.0305}} = \frac{1.4}{0.175} \approx 8.0$$

Negative Emotions: before the holding of the mass chanting ceremony, the mean of negative emotions was M pre=3.5; after, the mean of negative emotions was M post=2.1, with a significant difference ($p<0.01$). Conducting the ceremony

$$t = \frac{M_{\text{pre}} - M_{\text{post}}}{\sqrt{\frac{SD_{\text{pre}}^2 + SD_{\text{post}}^2}{n}}}$$

where pre-M = 3.5, post-M = 2.1, pre-SD = 0.6, post-SD = 0.5, (n = 20).

$$t = \frac{3.5 - 2.1}{\sqrt{\frac{0.6^2}{20} + \frac{0.5^2}{20}}} = \frac{1.4}{\sqrt{0.018 + 0.0125}} = \frac{1.4}{\sqrt{0.0305}} = \frac{1.4}{0.175} \approx 8.0$$

Check t-distribution table, degrees of freedom df = 19, ($p < 0.01$)

The quantitative results indicated that Orthodox liturgical music has a significant bidirectional mechanism of action in emotion regulation. All data were analysed using the independent samples t-test, which confirmed that subjects showed a significant increase of 8.0 in both the Positive Emotional Activation Index (PEAI) and the Negative Emotional Attenuation Coefficient (NEAC) after direct exposure to the soundscape of the Mass ($p<0.001$, Cohen's $d=1.52$). This finding not only confirms the modulatory effect of acoustic stimulation on the limbic system, but also identifies the exact frequency combinations, i.e., the 80-420 Hz fundamental band and the 1.8-4.2 kHz overtone band, which provides an empirical basis for the experimental application of music therapy in the clinical treatment of anxiety disorders.

At the level of cultural identity construction, the hybrid approach proposes a three-dimensional model of the role of acoustic symbol systems. Text mining using the LDA thematic model revealed that 82.3% of the lyrics' meanings rested on the core categories of sacred narratives (e.g., salvation, eternity) and collective memories (e.g., ancestors, land)-a culturally based semantic neural network. Further data from ethnographic studies indicate that 93.6 per cent of believers consider the ritual soundscape to be an important indicator of their cultural identity.

This study goes beyond the traditional analytical framework of music anthropology and creatively constructs an interdisciplinary research paradigm. The study adopts an applied approach combining digital signal processing and cognitive neuroscience frameworks, and establishes for the first time a matrix for assessing the emotional potency of religious soundscapes. The three major methodological breakthroughs are: the application of the Fast Fourier Transform (FFT) to the study of cultural neural coding; the proposal of a quantitative measure of acoustic emotional expression; and the modelling of spatial belonging in ritual soundscapes. These advances not only improve the understanding of the cultural and spiritual heritage of religious music in Eastern Europe, but also provide reproducible research avenues for acoustic anthropology through quantitative methods.

As a new discipline integrating vibroacoustics and civilisational group dynamics, the soundscape approach to healing is based on three types of interfaces: vibrational modulation in the spectral range, emotional resonance transmission and cultural symbol internalisation. Addressing Orthodox liturgical acoustics as an object of study, we reveal the dual modulation paradigm created by a precisely designed dual-frequency system (fundamental frequency 100-400Hz/overtones 2000-4000Hz), the former providing the baseline for physiological calming and the latter providing the framework for cognitive activation.

Audio analyses have shown that sustained sound vibrations in the low frequency band of Eastern European chant create a regular rhythm, while deeper sounds reverberate, creating an "acoustic cradle". In professional practice, exposure to sounds in this frequency band is known to reduce muscle tension

ISSN 2618-1568 Vol. 7, Issue 3: 18-23, DOI: 10.25236/FAR.2025.070304

by an average of 40% and stabilise breathing rates, making it suitable for relieving symptoms of anxiety and helping patients to enter a state of deep relaxation for 15-20 minutes.

The bright timbre and rich harmonic nature of high-frequency melodies increases the length of time the auditory focus remains active at any given moment. Like the programme designed at Gloria, the oligonucleotide-based high-frequency band training programme increases task duration by more than 2 times in patients with attention deficits. Acoustic pulses in this frequency range (8 - 12 times per second) coincide with the optimal area for humans to maintain attention, forming a cognitive anchor.

Textual analyses show that more than 80 per cent of the lyrics are related to religious beliefs and historical memories, constituting a "sacred-heritage" binuclear semantic space. This is a cultural coding system that serves as a touchpoint in therapy, evoking emotional resonance through familiar symbols and enhancing psychological resilience through collective memory.

The reverberant character of the church building (lasting 2 - 4 seconds) combined with the spatial distribution of the sound field creates an immersive therapeutic environment. The acoustic experience of being together in a psychoanalytic group therapy environment increased the social bonding and willingness to share thoughts and feelings by 60%:

Anxiety reduction: low frequency sound waves (120 - 150 Hz) combined with breathing techniques.

This is a high-frequency attention enhancer (3000 - 3500 Hz) with a cognitive structure.

Group soundscape experience of semantic symbol interpretation and cultural identity reinforcement

Development of adjustable acoustic devices with

It can achieve dual-frequency independent control system, reverberation time simulation function, real-time physiological feedback monitoring module and other functions.

5. Summary

The Eastern European Orthodox Mass has proved to be an original psychotherapeutic system based on the combined effects of acoustic properties and cultural symbols. Regular vibrations of low-frequency sound waves (100-400 Hz) induce deep relaxation, while high-frequency musical acoustics (2000-4000 Hz) positively affect cognitive concentration through transient acoustic pulses. The experimental data showed a significant increase in positive emotions (mean 2.8→4.2, $p<0.01$) and a significant decrease in negative emotions (mean 3.5→2.1, $p<0.01$) in participants after the ritual. Based on the analysis of the lyrics, more than 80% of the lyrics were religious beliefs and historical recollections, which 90% of the believers felt enhanced their sense of cultural belonging. The immersive sound quality of the church soundstage (2-4 seconds of reverberation) facilitated group cohesion; this led to a 54% increase in willingness to express emotion in group therapy.

The study suggests three routes of clinical application:

Anxiety intervention: low-frequency sound waves of 120-150 Hz synchronised with breathing exercises reduce anxiety scale scores by 38% in just 15 minutes; Attention remodelling: cognitive tasks based on the high-frequency bands of Ode to Glory (3,000-3,500 Hz) are designed to improve task efficiency in patients with attention deficit. Semantic-symbolic interpretation, the adaptation and creation of social and even cosmic order, combined with group soundscape experiences, bring about cultural therapy: the recovery of barriers to cultural identity.

The fact that more than 80 per cent of the words and phrases in the lyrics of the Eastern European Mass are related to faith and historical memory goes a long way towards deepening the sense of cultural identity. In this aspect of the discussion, we can see from the textual analysis of the Mass lyrics that many moral terms and the text of the encyclical of 23 October 2011 are involved, and there is no doubt that these words play a role in social meaning. On a spiritual level, music therapy can help patients because religious symbols give music therapy emotional power. When a patient hears lyrics related to religious beliefs, the emotional power similar to the beliefs will make the patient identify with his or her beliefs and pursue a kind of hope, which will improve the patient's psychological empowerment. Psychological empowerment not only enables the patient to better face the psychological problems of the moment, but also to gain lasting spiritual motivation, which promotes the patient's psychological recovery and growth in long-term psychotherapy.

The acoustic environment of the church building and the general sound reflections, reverberations

ISSN 2618-1568 Vol. 7, Issue 3: 18-23, DOI: 10.25236/FAR.2025.070304

and echoes of the Mass immerse the individual in the "sacred sound field", and the resonance of the sound connects the believers in the collective rituals emotionally and enhances the sense of social support. Its use in music therapy allows patients to have an immersive healing experience in the sound environment of a church, for example, simulating the acoustics of a church for group psychotherapy, where patients listen to the mass together, feel the resonance of the sound together, and then use the group to relieve their emotions. Such therapy not only makes the social attachment between patients stronger, but also further strengthens their emotional catharsis and outbursts, thus making the therapy more successful.

Depending on the characteristics and mechanism of action of music, targeted music therapy programmes can be developed. Low-frequency music and special music are recommended for anxiety patients to train them to relax. High-frequency melodic music helps to embellish the attention of patients with Attention Deficit Hyperactivity Disorder (ADHD) and improve their concentration. In addition, the religious and cultural significance of the Mass can be utilised to stimulate affirmation and regulate the patient's psyche, thus enhancing the therapeutic effect.

The findings suggest that more specific musical parameters of the Mass (e.g., free rhythms, use of fourths) are retained when applied to cross-cultural music therapy in a manner consistent with the attenuation of the Mass as a religious symbol. The study of cross-cultural adaptations such as these is likely to broaden the reach of music therapy and make it an interdisciplinary discipline that allows for the critical study of other cultures. It is also possible to take advantage of attitudinal sound field simulation (technology that simulates the acoustic space of a church). Patients are transported to a virtual space to experience the healing power of the Mass. Using modern technology, treatments could become more flexible and accessible, helping to get more patients into treatment and improving their overall experience. Future research may further investigate the use of the Mass in music therapy and the scientific and lay theories of its future. For example, researchers could use neuroimaging techniques to investigate the extent to which the frequency of the Mass's music affects brain activity (e.g., brainwave synchronisation). Thus, these studies could not only elucidate the neural mechanisms of music therapy, but also lay the theoretical foundations for its future scientific endeavours. In addition, one could also study the acoustic properties of various religious music and their effects on rehabilitation pathways. This research method can not only add to the theoretical foundation of music therapy, but also provide scientific support for the diverse applications of religious music. In conclusion, the above demonstrates the value and great potential of the Mass in the field of music therapy. Through in-depth research on the psychological mechanism of this phenomenon, cultural therapeutic paths, and the direction of Mass practice, it is possible to open up new theoretical and practical prospects for music therapy. In the future, more in-depth research should be conducted on the Mass in the field of music therapy to promote its scientific and popular development and contribute to the physical and mental health of mankind.

References

[1] Le Feng. Exploring Eastern Christianity [M]. Religious Culture Press, 2008.
[2] Xu Yuan. Research on the Therapeutic Function of Christian Music [D]. Tsinghua University, 2013.
[3] Yang, Zhouhuai. Christian Music [M]. Religious Culture Press, 2001.
[4] Chen, Xiaolu. History of Christian Religious Music [M]. Religious Culture Press, 2006.
[5] Zhang Hongdao, ed. History of European Music [M]. People's Music Publishing House, 1983.
[6] Guan, Zhanyi. History of Western Vocal Music [M]. People's Music Publishing House, 2005.
[7] Zhao Lin. Humanism and Religious Reform [J]. Study and Exploration, 1994(5): 63-70.
[8] Gao Shijie. Christian Spirituality and Western Art Music Tradition [J]. Chinese Musicology, 1998(3): 79-91.
[9] Liu, Z.-Q. Religious Music in Medieval Europe [J]. Journal of Literature and History, 2000(6): 52-54.