

**SOUNDSCAPE ECOLOGY: IMPACTS ON BEHAVIOUR AND MOOD**

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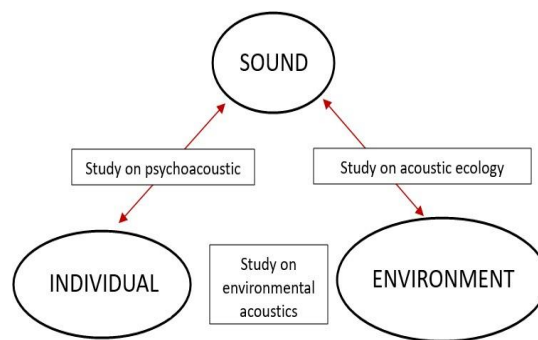
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**ABSTRACT**

The 'Soundscape' concept intricately explores the perception of sounds at both individual and societal levels, revealing a profound connection between humans and their environment. Environmental sounds, spanning mechanical, human, and natural sources, symbolize the interconnectedness of humans and nature, fostering a tangible relationship. Scientifically, sound meditation proves effective in stress alleviation, positively impacting the autonomic nervous system. Theoretical frameworks, including Psychoacoustics, emphasize physiological aspects of sound perception and the amygdala's role in emotional responses. Cultural and individual variations in soundscape perceptions underscore the communicative relationship between humans and their environment, serving as a cultural landscape. Elements like natural sounds impact mood, contributing to research on workplace productivity and emotional dimensions of music. Urban soundscapes and therapeutic soundscapes influence stress and cognitive functions, while sound's role in healing environments, like nature-based rehabilitation and music therapy, highlights its potential in mental health. Cultural perspectives reveal cross-cultural sound preferences, emphasizing sounds as intangible cultural heritage. Ritualized music underscores the need to understand diverse mechanisms inducing positive changes across cultures in sound perception.

**KEYWORDS:** Soundscape, Psychoacoustics, Mood Impacts, Sound Meditation, Cultural Perspectives.**1. INTRODUCTION**

**1.1 Soundscape:** The term 'Soundscape' denotes a sonic environment or sound setting, concentrating on the perception and comprehension of noises across various cultural levels, ranging from the individual to social institutions.<sup>[8]</sup> The auditory ecology commonly refers to the auditory environment as the 'soundscape.' In essence, the soundscape serves as the auditory counterpart to the visual landscape, where a diverse range of sounds converges in a specific context to create an acoustic representation of the observer's surroundings. Environmental sounds originate from various sources, encompassing mechanical, human, and natural elements.<sup>[1]</sup> Engaging in a soundscape is a sensory encounter where an individual's body resonates with the surroundings, immersing them in the landscape and establishing a connection between humans and their environment. Soundscapes facilitate a comprehensive understanding of the human-nature relationship, exemplified by a distinctive sound specific to a particular place.<sup>[8]</sup>

**Fig.1: Perception of sound.****1.2 Importance of soundscape in daily life**

Sound healing, acknowledged as sound bath, sound therapy, or sound meditation, is a unique therapeutic approach in integrative medicine, leveraging vibrations' therapeutic potential. It involves bell-like vibrational instruments like singing bowls, gongs, and others. The term "sound bath" stems from the sensation participants experience, akin to gentle "washing" of sound and vibration over the body. Situated at the intersection of music therapy and meditation, sound healing, or sound bath, epitomizes a less conventional form of vibrational healing gaining recognition. This practice employs vibrational instruments, such as singing bowls and gongs, offering participants a unique, "washing" sensation of

sound and vibration over the body. It lies at the crossroads of music therapy and meditation, representing an increasingly acknowledged form of unconventional vibrational healing.<sup>[2]</sup>

### 1.3 Impact of soundscape on behavior and mood

The connection between stress and tension is linked to various health issues like cardiovascular disease, diabetes, drug addiction, and mental health problems. The relaxation response, marked by reduced blood pressure and the activation of the PNS functions as body's physiological mechanism for relaxation, counteracting the fight-or-flight response. Whether reclining and experiencing a blend of intense, subsonic sounds produced by a meditation bowl could elicit a deep relaxation response and enhance mood and overall well-being. Sound healing, a practice with roots extending back centuries and embraced by diverse cultures globally, including indigenous peoples, has been employed in various forms.<sup>[3]</sup>

Empirical evidence has substantiated the adverse effects of emotional stress on both mental and physical well-being. Stress not only affects the nervous and endocrine systems but also leads to immune system impairment, cognitive dysfunction, and an elevated risk of chronic diseases. One specific stress-affected pathway involves the autonomic nervous system, characterized by heightened sympathetic nervous system activity (fight-or-flight) and reduced parasympathetic nervous system activity (rest-digest). Meditation, as a broad category, has demonstrated noteworthy positive effects on the nervous system, particularly enhancing the parasympathetic nervous system, consequently reducing overall stress. Investigations into various meditation practices, including mindfulness-based stress relaxation, Yoga Nidra (a form of Yogic relaxation), and singing bowl meditation, reveal substantial benefits for mood and general well-being. These practices contribute to improved physiological balance, decreased anxiety, and stress reduction.<sup>[4]</sup>

## 2. Overview of Psychoacoustics

Sound encompasses diverse definitions, often described as "a wave that physically travels through a medium, typically air, usually originating from the vibrations of a mechanical object." Whether transmitted live or captured and played back through a suitable device, humans perceive sound through their auditory pathway, guiding it through mental processing. The human auditory pathway consists of the outer and middle ears, cochlea, auditory nerve, brain stem nuclei at various levels, and multiple fields in the auditory cortex, where the stimulus culminates after traversing the entire hearing system. Sound, essentially vibrating waves, transforms into sensations when it reaches the eardrum, converting the waves into middle ear vibrations that trigger a perceptual response in the brain. These sensations manifest as frequencies measured in Hertz (Hz).<sup>[5]</sup>

### 2.1 Influence of Sound on the Brain and Emotions

The term "amygdala" refers to a human brain region situated in the anteromedial temporal lobe, approximately 1.7 cm<sup>3</sup> in size, comprising around a dozen nuclei with unique characteristics. Anatomical studies in rodents and primates have enabled the classification of three main subnuclei groups: superficial (SF), centromedial (CM), and laterobasal (LB). This categorization forms the basis for a probabilistic map aligning with human brain imaging data. Human amygdala connectivity, revealing distinct functional patterns for the three subdivisions. LB exhibited connections with frontal and temporal regions, CM with the striatum, and SF with other limbic structures, suggesting specialized roles for each subdivision in brain function. Auditory inputs to the lateral amygdala come from two sources: a direct pathway from the auditory thalamus (MGm) via the extralemniscal route, and an indirect route through primary and non-primary auditory cortices within the lemniscal auditory afferent pathway.

- **The Amygdala's Involvement in Decoding Acoustic Elements of Social Interaction:** Connection and human positioning in relation to the natural world. This genuine integration with a place endures through continual, everyday human-nature interactions. The ordinary nature of these interactions is pivotal, as a spiritual connection should emerge from routine engagement, nurturing an Earth ethics recognizing life-supporting elements. Sensory experiences play a role in connecting with the natural world, involving visual, auditory, olfactory, tactile, and gustatory senses. Tom Sullivan highlights humanity's intricate link to the world through a combination of senses, tying us to specific experiences in specific places. Initially characterized as landscapes represented by sounds, they constitute an intricate network of human-nature relationships embodied and conceptualized as a cultural landscape.

- **Role of the Amygdala in Processing Non-Communication Based Sounds**

Cognitive neuroscience has played a pivotal role in investigating how the brain responds to emotionally charged sounds encountered in daily life. Studies focusing on environmental sounds, specifically comparing reactions to unpleasant sounds with neutral ones, have been a central theme in neuroimaging research. The escalation in loudness, referred to as "auditory looming," might indicate the perception of a sound object approaching the listener. Amygdala activity in response to this could signify a reaction to a potential environmental threat. While the amygdala consistently responds to unpleasant sounds, the response to pleasant sounds can exhibit variability. In contrast to certain studies reporting similar reactions to both positive and negative emotionally charged sounds, others have identified distinctions in the amygdala response.<sup>[1]</sup>

## 2.2 Cultural and individual variations in perceptions of soundscape

Concepts like 'residing in a location,' 're-inhabiting,' and 'insideness' articulate the connection and human positioning concerning the natural world. This authentic integrity of a place is upheld over time through routine and ongoing human-nature interactions. The crucial aspect lies in the ordinary nature of these interactions. A spiritual connection with a place should evolve from everyday engagement, fostering an Earth ethics and culture capable of recognizing life-supporting elements. The resulting relationship is dialogical and communicative, creating a two-way, two-place

connection where people belong to the land as much as it belongs to them. Moreover, the connectivity with the natural world involves sensory experiences, encompassing visual, auditory, olfactory, tactile, and gustatory senses. In the context of soundscapes, initially defined as landscapes represented by sounds. Operating as an intricate network of human-nature connections, soundscapes are embodied and conceptualized as cultural landscapes. They assist individuals in recognizing their position within the surrounding environment. According to Casey, soundscapes are perceived and interpreted by individuals attending to them, shaping their sense of place in the world.<sup>[6]</sup>

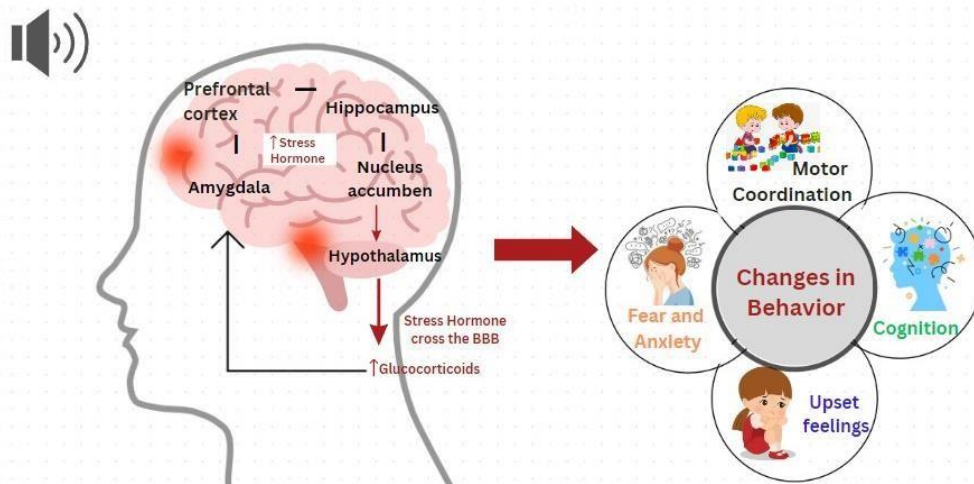


Fig 2: View of the Brain interaction in response to soundscape.

## 3. Elements of Soundscape

### 3.1 Natural sounds vs. Artificial sounds

Soundscape evaluation involves two fundamental dimensions: pleasantness and eventfulness, illustrating their interconnected nature. Extensive research supports the dynamic link between how individuals (without disabilities) assess their auditory environment and their reported mood. Finding relaxation in an unpleasant auditory setting is challenging, driving people to actively seek quiet and pleasant surroundings for stress recovery. The proposition that natural environments, known for tranquility and harmony, are optimal for relaxation is substantiated by research associating pleasant auditory environments. While the correlation between the quality of soundscapes and well-being is recognized, there is a scarcity of research examining soundscapes in the context of special needs care. Enhancing soundscapes for individuals with severe intellectual and multiple disabilities requires a deeper understanding of how specific sound types impact their well-being. The ambient music recording, characterized by a calm and slow tonal composition, aimed to create a tranquil atmosphere distinct from the two natural recordings, lacking natural source characteristics.<sup>[7]</sup>

### 3.2 Volume, Pitch, and Tempo

#### • Volume impact on acoustic comfort

The assessment of acoustic comfort holds significant

importance in indoor settings, as noise disturbance can impact subjective health. The International Organization for Standardization provides a definition for soundscape as the acoustic environment that individuals perceive or experience. Studies show birdsong and water sounds enhance soundscape quality. The sound pressure level of music is vital, impacting acoustic comfort. Background music, when controlled appropriately, can effectively improve work efficiency, as demonstrated by Oldham's research. The connection between acoustic comfort and sensation is affected by the sound pressure level of overlaid music.

#### • Pitch influence on acoustic sensation

Music, with its diverse melodies, tempos, and tones, elicits varied effects on sensory organs, contributing to emotional well-being. Although different noise types have varied effects on human perceptions. The type of noise exerts minimal influence when combined with music to improve the acoustic environment. The tempo of the music has negligible effects on acoustic sensation, underscoring the significance of sound pressure levels in shaping perception.

#### • Tempo and sound pressure levels in acoustic comfort

Though music has the potential to elevate the acoustic environment and enhance comfort, the tempo of the music

has minimal impact on acoustic sensation. Nevertheless, the sound pressure levels of both noise and music play a crucial role in influencing both acoustic sensation and comfort. Proper control of music's sound pressure level is essential, as a large difference or similarity to noise levels limits the effectiveness of music in improving the acoustic environment. Consideration of tempo and volume is crucial in achieving optimal acoustic comfort.<sup>[8]</sup>

#### 4. Impact on Behavior

##### 4.1 Workplace productivity

Researchers in the hospitality field have provided limited attention to understanding how the physical environment influences the emotions and behavior of customers within hospitality service settings. Despite the acknowledgment that the physical environment is among the most influential factors shaping the psychological state and behaviors of customers in a hedonic hospitality service setting, this aspect has received minimal attention in research.<sup>[9]</sup>

##### 4.1.1 Open offices vs. Closed spaces

One crucial aspect of the service environment in hotels and restaurants is the soundscape, a term encompassing any auditory field of study, from music compositions to acoustical environments. Despite its significance, empirical evaluations of soundscape effects on patrons' overall experiences are only nascent in restaurant and hotel settings. The impact of sound varies among individuals, influenced by their noise sensitivity and mood in the sound environment. Past studies indicate that noise sensitivity significantly contributes to individual differences in noise perception, with noise-sensitive individuals likely experiencing heightened negative emotions like annoyance. Donovan and Rossiter (1982) introduced the concept of "screeners" (low noise sensitivity) and "nonscreeners" (high noise sensitivity), suggesting that arousal levels in an environment are related to individual stimulation experiences. Luz argued that noise-sensitive individuals would likely experience increased negative affectivity and greater disturbance in various acoustic conditions.<sup>[9]</sup>

The soundscape, encompassing the auditory environment's subjective perception, significantly influences our physical and psychological well-being (World Health Organization, 2011). Distinct from traditional acoustic metrics, the soundscape emphasizes subjective appraisal with two key dimensions: pleasantness and eventfulness. Mirroring mood, these dimensions intertwine, evidenced by research highlighting the dynamic interplay between individuals' assessment of auditory surroundings and mood expression. Unpleasant soundscapes impede relaxation, compelling individuals to actively seek serene environments for stress recovery, underscoring the pivotal role of subjective sound appraisal in shaping well-being.<sup>[7]</sup>

##### 4.1.2 Effects on concentration and memory

Music therapy has proven effective in enhancing cognitive functions, alleviating anxiety and depression, and reducing aggressiveness in individuals with brain injuries, leading to notable improvements in mood, communication, and independence. Advancements in functional imaging have facilitated the examination of music's impact on cerebral functions. Studies on brain lesion patients reveal the engagement of various brain areas in processing musical information. Active therapy involving instrument play enhances cognitive and psychomotor functions, while receptive therapy, centered on listening to music, diminishes anxiety and depression, promoting verbal expression of patients' distress. Easily integrable into multidisciplinary programs, music therapy significantly influences memory, anxiety-depression, and agitation disorders.<sup>[10]</sup>

#### 5. Influence on Mood

The impact of music on our emotions is a well-established aspect of daily life. However, the precise mechanism through which music elicits a range of feelings, from joy and a sense of connection to poignant sadness and despair, remains a profound mystery. It is conceivable that without our particular social-emotional brains, human music might be perceived merely as intellectually intriguing sound sequences or, at worst, as bothersome dissonance. Instead, music has the remarkable ability to evoke a diverse array of intense emotional experiences. It serves as a conduit for exploring our deepest nature and appreciating the emotional dimensions of our minds. Undoubtedly, music serves as an expressive outlet for our feelings, offering a distinctive and ethically rich avenue for exploring the emotions of the human brain and mind.<sup>[11]</sup>

##### 5.1 Urban soundscapes

The redevelopment of city centers necessitates a rethinking of urban open spaces within the context of evolving urban dynamics. An essential aspect of this reevaluation is the consideration of sound quality in the ecological and sustainable development of urban landscapes. In recent years, the concept of the soundscape has gained prominence as a key method for enhancing the auditory experience in urban open spaces. Unlike traditional noise level measures, the soundscape aligns more effectively with the complex factors influencing human experiences in urban settings. This is underscored by research indicating that human reactions to sound extend beyond mere physical perception, encompassing aesthetic sensations derived from the environment. The soundscape, thus, offers a comprehensive approach in urban planning and landscape design, catering to the multifaceted nature of human experience in urban open spaces and contributing to the creation of more engaging and harmonious environments.<sup>[12]</sup>

##### 5.1.1 Traffic, noise and stress

Noise is characterized as "meaningless or irrelevant data

or output accompanying desired information," often denoting undesirable and disruptive sounds. Extensive epidemiological studies and a World Health Organization document highlight noise pollution as a profoundly disturbing environmental factor. The escalating severity of noise pollution parallels the advancements in modern society, prompting widespread societal concern. Noise permeates both indoor and outdoor settings, significantly impacting environments and human comfort. Early soundscape studies primarily focused on diverse urban environments, recognizing the crucial role of the urban acoustic environment in overall human comfort. Evaluating soundscape quality involves the development of descriptors, frameworks, and methodologies for data collection. Environmental research underscores the use of birdsong and water sounds to enhance soundscape quality. This study delves into the subjective evaluation of the distracting or masking effects of music tempo and volume across different noise conditions. Furthermore, suggestions for improving the noise environment are proposed.<sup>[8]</sup>

**5.1.2 Green spaces and Positive mood**

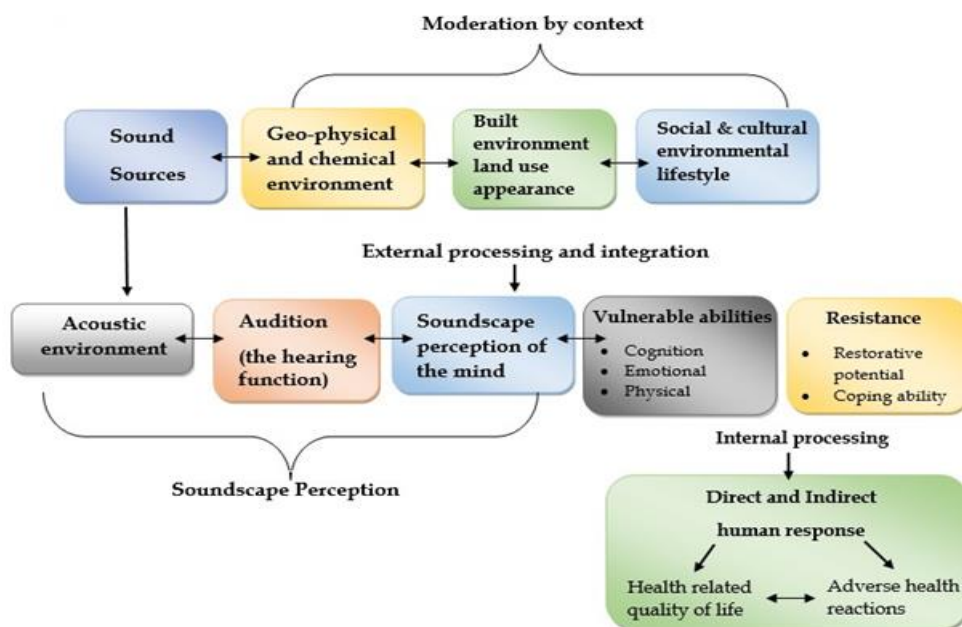
The theoretical foundation for understanding the stress recovery and restorative potential of green spaces largely relies on two frameworks: Attention Restoration Theory (ART) and Stress Reduction Theory (SRT). According to ART. Participating in mentally challenging activities can result in directed attention fatigue, whereas natural surroundings aid in replenishing directed attention. The potential for attention restoration in an environment is determined by four qualities—fascination, being-away, compatibility, and extent. These factors collectively influence an environment's capacity to restore attention. Natural environments, with their intrinsic qualities, are believed to excel in providing these restorative qualities. Particularly, the sounds of birds have been linked to the

restoration of attention. Stress Reduction Theory (SRT) suggests that favorable encounters and engagements with nature can produce physiological advantages, resulting in the reduction of stress and a transition towards relaxation and positive alterations in mood. In essence, both ART and SRT highlight the significant role of nature, particularly natural environments, in promoting cognitive restoration and reducing stress through various inherent qualities and positive interactions.<sup>[13]</sup>

**5.2 Therapeutic soundscapes**

**5.2.1 Healing environments**

Mental health issues are a significant global cause of work disabilities, leading to profound impacts on daily life and long-term well-being. Studies suggest that exposure to natural atmosphere can contribute to mental recovery, improving concentration and alleviating perceived stress. Nature-based rehabilitation (NBR) has shown promise, particularly in treating stress-related mental conditions like exhaustion disorder. Caregivers in NBR emphasize the role of sensory stimuli from outdoor nature experiences in facilitating patients' openness to treatment. This aligns with the concept of 'soft fascination' in Attention Restoration Theory (ART), where unstructured experiences in nature promote mental recovery. A new aspect identified in NBR for individuals recovering from stress-related disorders is "social quietness," emphasizing the therapeutic value of solitary encounters with nature. Building upon a prior investigation that briefly explored the influence of sound in rehabilitation gardens, the current study seeks to thoroughly analyze the importance of sound in Natural Restorative Environments (NBR) for individuals with stress-related mental disorders. The findings hold implications for the design of restorative spaces conducive to mental recovery in the future.<sup>[14]</sup>



**Fig 3: Impact of soundscape on general lifestyle.**

### 5.2.2 Music Therapy

Music serves as a potent source of human enjoyment, eliciting emotions and pleasure. With its diverse melodies, tempos, and tones, music has varying effects on individuals' sensory organs. It possesses the capability to effectively alleviate stress and contribute to overall well-being. This capacity stems from human instinct, where alterations in emotions directly impact individuals' experiences within a physical environment. Research conducted by Oldham indicates that background music is proficient in enhancing work efficiency.<sup>[4]</sup>

## 6. Cultural Perspectives

### 6.1 Cross-cultural variations in sound preferences

Sound has the potential to embody the natural, cultural, and historical aspects of a location, sometimes residing in collective memory as "soundmarks" specific to a place. These distinctive sounds, as coined by Schafer (1985), serve as shared references for a community, fostering a sense of identity and connection to a particular locale. When contemplating the intersection of sound and sustainability, it becomes crucial to explore innovative approaches that encourage the aesthetic, appreciative, and celebratory aspects of community life through auditory experiences. The concept of Intangible Cultural Heritage (ICH), defined by UNESCO, offers a relevant framework. ICH encompasses practices, expressions, knowledge, skills, and cultural elements recognized by communities, transmitted across generations, and continually recreated in response to their environment and history. Sound, given its transient nature, can be a component of ICH, serving as a means to articulate this heritage. ICH, being interactive and dynamic, contributes to cultural continuity, fostering a sense of identity and promoting human creativity and diversity through its transmission from one generation to the next.<sup>[6]</sup>

#### 6.1.1 Ritualistic and spiritual uses of sound

Music holds a significant role in meaningful rituals across various cultures globally. In traditional contexts, these rituals serve diverse purposes such as healing, navigating challenges, transcending consciousness, fostering community strength, and promoting healing. Music and chanting are considered essential tools in bringing about transformative changes in people's lives within these cultural practices. While specific cultural beliefs tied to ritualized music may not be directly testable by science, there is an accumulating body of reliable evidence suggesting that chanting can exert physiological and psychological impacts. Altering breathing patterns, chanting influences the parasympathetic nervous system, promoting relaxation, reducing stress, and enhancing cardiovascular functioning. Through offering a clear and repetitive focal point for attention, chanting fosters mindfulness and improves thought self-regulation. Socially, chanting provides strong cues for synchrony, enhancing cooperation and feelings of connectedness. Triggering subtle and profound shifts in conscious states, chanting can have enduring positive effects on attitudes. Additionally, within ritualized settings, chanting

establishes robust patterns of belief within a rich cultural context, influencing positive behaviors. Understanding how music facilitates positive change across diverse cultures paves the way for a more comprehensive science of music.<sup>[15]</sup>

## 7. CONCLUSION

The concept of soundscapes, encompassing mechanical, human, and natural sounds, underscores the intrinsic connection between humans and their environment. Sound meditation, particularly with instruments like meditation bowls, has proven effective in reducing stress and enhancing the autonomic nervous system, supporting overall well-being. Theoretical frameworks such as psychoacoustics shed light on the physiological processes of sound perception and the amygdala's critical role in emotional responses. Cultural and individual variations in soundscape perceptions highlight the communicative relationship between humans and their surroundings, with soundscapes serving as cultural landscapes that influence daily life and mood. Natural sounds significantly contribute to positive mood and workplace productivity, while urban and therapeutic soundscapes play a vital role in stress reduction and cognitive functions. The potential of sound in healing environments, particularly through nature-based rehabilitation and music therapy, emphasizes its importance in mental health.

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