

Creating Healthier Living Environments: The Role of Soundscapes in Promoting Mental Health and Well-being

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Creating Healthier Living Environments: The Role of Soundscapes in Promoting Mental Health and Well-being

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Abstract—

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I. BACKGROUND

WHILE people are living longer than ever before and life expectancy is globally continuing to increase, at least for the present, we are facing increasing mental health challenges such as anxiety, stress, and depression. Over the past few decades, the focus has shifted from basic survival to the quality of life and well-being [1]. This concept becomes a consensus, but the subdivision and fine-grained studies are still ongoing. In this background, soundscapes (e. g., the role of perceived restorativeness and emotional influence) are closely related to our feelings in everyday life, given the definition as "the acoustic environment as experienced and perceived by individuals in a given context" [2]. Herein, it highlights the difference between the acoustic environment, a physical phenomenon, and the soundscape, a perceptual construct.

In the 1960s, the pioneering works in soundscape emerged [3], [4]. In the span of over 50 years, soundscapes have been extensively examined from multiple perspectives across various disciplines. However, the intricacies of human experience and perception render soundscape research still a challenging task. The acoustic environments that appear similar may be perceived differently due to nuanced moods, individual differences, or different combinations of environmental factors. To address this challenge, first, we need to

revisit numerous soundscape studies evaluating how acoustic environments are perceived by people in ever-changing daily lives within social and cultural contexts. Second, it is crucial to comprehend the role of various soundscapes in influencing our mental health and well-being. Third, it is essential to further understand design interventions that shape soundscapes, ultimately aiming to create healthier living environments (Fig. 1).

A. Evaluating Acoustic Environments and Soundscapes

When revisiting existing studies, it is not difficult to discover that concrete findings on soundscape assessment is complicated. There is a common framework of sound, context, and people (or the model of source-path-receiver) [5]. Firstly, four general categories of sound sources are human-generated sounds (e.g., talking, singing and footsteps), natural sounds (e.g., streams, wind, rain, birds, and other animal sounds), mechanical sounds (e.g., equipment operation and vehicles), and music [6], [7]. Secondly, the specificities of soundscapes vary depending on different contexts. For instance, when considering soundscapes inside buildings, different characteristics in hospitals, airports, stations, shopping malls, schools, markets, offices and nursing homes need to be evaluated [8]. The assessment of outdoor soundscapes also differs, considering the distinct spatial settings of urban parks, blue-green spaces, squares, outdoor commercial spaces and streets [9]. Thirdly, different groups of people might perceive similar sound in different ways (e.g., special populations, special occupations, educational differences, growth environment differences, and age and gender differences) [10]. In addition, some studies emphasized the importance of multi-sensory interactions in soundscape assessment (e.g., audio-visual interactions, sound-smell interactions, and sound-thermal interactions), pointing out that other factors play an interactive role in how individuals perceive soundscapes [11], [12]. Overall, how to understand a more precise and personalised experience of soundscapes in urban public spaces needs to be further studied. There are still many challenges in evaluating acoustic environments and soundscapes, including the consideration of multiple, complex, and interactive assessments in relation to various people and specific spaces.

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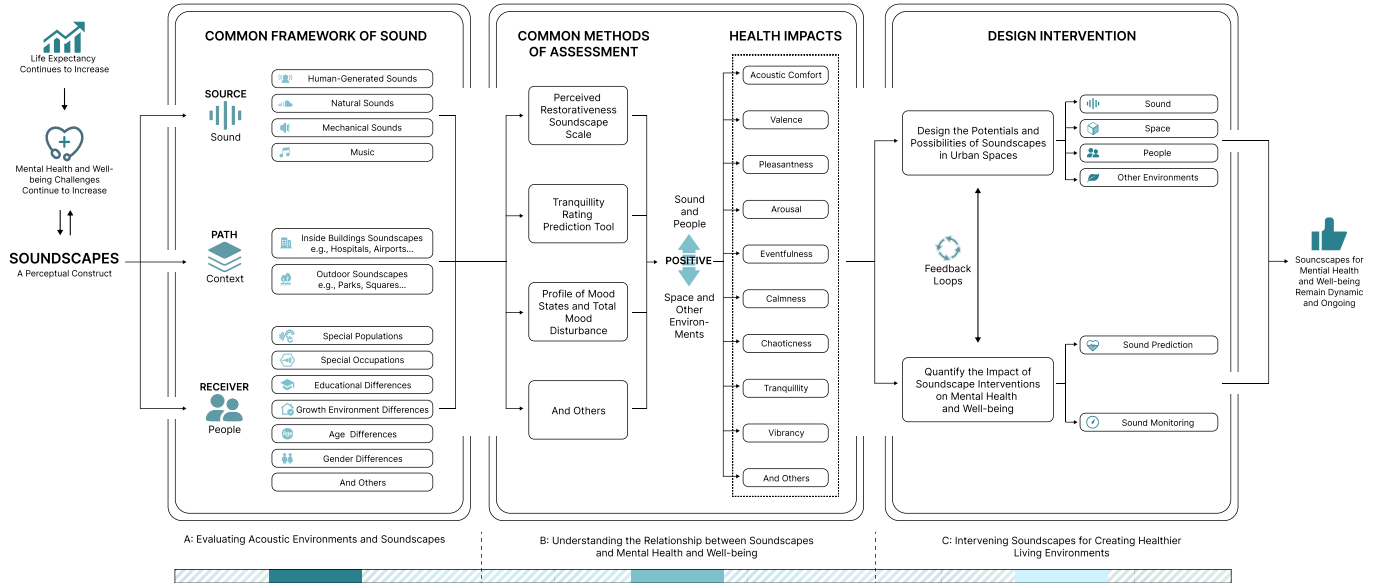


Fig. 1. A framework for the role of soundscapes in promoting mental health and well-being

B. Understanding the Relationship Between Soundscapes and Mental Health and Well-being

How do soundscapes affect human health and well-being? It is widely acknowledged that natural sounds have health impacts (e.g., restoration and less stress) [6], [13]. For example, Chen and Kang indicate that natural sounds can alleviate stress and encourage social interactions, thereby being essential for maintaining mental health and well-being [14]. In general, the positive impacts of soundscape include acoustic comfort, valence, pleasantness, arousal, eventfulness, calmness, chaoticness, tranquillity, and vibrancy. Common methods of assessment of these relationships involve the perceived Restorativeness Soundscape Scale, the tranquillity rating prediction tool, or the profile of mood states and Total mood disturbance [15]. These studies indicate that creating healthier living environments is a multifaceted endeavor that encompasses numerous strategies, among which the soundscapes and acoustic environments play an important role in our daily lives. However, along with the new technologies and industrial revolution, our lifestyles and needs will also change [12]. The relationship between soundscapes and our emotional well-being or other health benefits thereby remains in flux. Namely, long-term challenges in the health impacts of soundscape research in such changing situations should be explored.

C. Intervening Soundscapes for Creating Healthier Living Environments

Despite the growing evidence, it remained unclear how to design and intervene soundscapes in urban spaces for mental health and well-being. In general, the design potentials of soundscapes need to consider four fundamental elements (i. e., sound, space, people, and other environments) [12]. In the design process, it is crucial to consider not only mitigating

negative noise but also implementing interventions to cultivate a more positive sound environment, enhancing the overall experience. It is worth noting that the accuracy requirements for the design intervention of urban soundscapes are relatively less stringent compared to room acoustics, allowing for a harmonious balance between scientific precision and practical feasibility [12]. In light of some soundscapes being open, multiple, and unpredictable (e.g., bird songs and rain sounds), we must think about how to design the possibilities of soundscapes in urban spaces, which brings more challenges in the design intervention of soundscapes. In addition, soundscapes are inherently complex due to the diverse nature of their potential uses and interpretations. Such design interventions also need to be examined in the context of specific places and demographic groups, such as age, gender, ethnic and cultural backgrounds. This ensures that the design of soundscapes is inclusive and tailored to different contexts.

Quantifying the impact of soundscape design interventions on mental health and well-being is of paramount importance. Sound prediction and monitoring have emerged as innovative design tools for evaluating and enhancing soundscape designs [12]. These tools enable designers to anticipate and measure the impact of sound interventions, thereby improving their effectiveness. Moreover, when designing soundscapes, it is essential to incorporate feedback loops that facilitate sound interventions. This approach can enhance the consistency and effectiveness of the design outcome, as it allows for continuous refinement based on real-time feedback [7]. For example, the integration of Artificial Intelligence into this feedback loop holds promise for advancing soundscape design in the future, enabling more responsive and effective designs.

D. Conclusion

The field of soundscape studies has undergone a shift from noise control towards soundscape creation, and also a shift from soundscape evaluation to design practices for promoting mental health and well-being. Now, it is the time for a call to action, urging scientists, designers, planners, and policymakers to work together. We must undertake a comprehensive evaluation of acoustic environments and soundscapes, along with their impacts on mental health and well-being. Additionally, we must intervene in soundscapes to create healthier living environments for all. Given the ever-evolving nature of our living environments and lifestyles, healthy soundscape studies and practices remain dynamic and ongoing.

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