OYA YILDIZ

A COMPARATIVE STUDY ON SOUNDSCAPE PERCEPTIONS OF PATIENTS, PATIENTS' RELATIVES, AND HEALTHCARE STAFF IN BİLKENT UNIVERSITY HEALTH CENTER AND BİLKENT CITY HOSPITAL ONCOLOGY OUTPATIENT POLYCLINIC

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A Master's Thesis

by
OYA YILDIZ

Department of
Interior Architecture and Environmental Design
İhsan Doğramacı Bilkent University
Ankara
August 2025

To my loved ones

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The Graduate School of Economics and Social Sciences
of
İhsan Doğramacı Bilkent University

by

OYA YILDIZ

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THE DEPARTMENT OF
INTERIOR ARCHITECTURE AND ENVIRONMENTAL DESIGN
İHSAN DOĞRAMACI BİLKENT UNIVERSITY
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By Oya Yıldız

I certify that I have read this thesis and have found that it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Fine Arts in Interior Architecture and Environmental Design.

Semiha Yılmazer
Advisor

I certify that I have read this thesis and have found that it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Fine Arts in Interior Architecture and Environmental Design.

Arzu Gönenç Sorguç
Examining Committee Member

I certify that I have read this thesis and have found that it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Fine Arts in Interior Architecture and Environmental Design.

Nuri Cihan Kayaçetin
Examining Committee Member

Approval of the Graduate School of Economics and Social Sciences

---
Refet S. Gürkaynak
Director

ABSTRACT

A COMPARATIVE STUDY ON SOUNDSCAPE PERCEPTIONS OF PATIENTS, PATIENTS' RELATIVES, AND HEALTHCARE STAFF IN BİLKENT UNIVERSITY HEALTH CENTER AND BİLKENT CITY HOSPITAL ONCOLOGY OUTPATIENT POLYCLINIC

Yıldız, Oya
MFA., Department of Interior Architecture and Environmental Design
Supervisor: Assist. Prof. Semiha Yılmazer

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This thesis aims to compare soundscape perceptions in the waiting areas of two different outpatient healthcare environments, which are the Bilkent University Health Center and the Bilkent City Hospital Oncology Polyclinic. The Health Center is a small facility located on the university campus, whereas the Hospital Polyclinic is a part of the much larger city hospital complex. 138 participants took part in the study, including 70 individuals at the University Health Center and 68 at the Hospital Polyclinic. Participant groups included patients, patients' relatives, and healthcare staff, allowing for comparisons across user groups within settings. Perceptual data were collected on-site using a questionnaire based on ISO/TS 12913-2 Method A. Measurements of equivalent continuous A-weighted sound levels (LAeq) were also taken during peak occupancy in both settings. The questionnaire data were analyzed using IBM SPSS 27.0 Statistics software. Significant differences were tested with non-parametric tests (Kruskal–Wallis and Mann–Whitney U). Correlations were

examined using Spearman's Rho. The results revealed that human sounds were the most dominant source in both healthcare settings, consistently identified by all user groups. Perceived Affective Quality (PAQ) results showed that the University Health Center was perceived as significantly more uneventful, calm, and vibrant, whereas the Hospital Polyclinic was perceived as more annoying and chaotic. In the Health Center, healthcare staff perceived the soundscape as significantly more vibrant than patients and patients' relatives, while no significant differences were found among user groups in the Hospital Polyclinic. The sound environment in the Health Center was also rated as more appropriate than Hospital Polyclinic. Correlation analysis further showed that longer stays in waiting areas of both settings were associated with negative perceptions, which were greater in the Hospital Polyclinic. These results emphasize how differences in environmental characteristics between the two settings influence users' auditory perceptions and show that different user groups may perceive the same environment in different ways.

Keywords: Soundscape Perception, Auditory Perception, Healthcare Environments, Acoustic Environment, User Experience

ÖZET

BİLKENT ÜNİVERSİTESİ SAĞLIK MERKEZİ VE BİLKENT ŞEHİR HASTANESİ ONKOLOJİ POLİKLİNİĞİNDE HASTA, HASTA YAKINLARI VE SAĞLIK ÇALIŞANLARININ İŞİTSEL ALGILARINI KARŞILAŞTIRMAYA YÖNELİK BİR ÇALIŞMA

Yıldız, Oya
İç Mimarlık ve Çevre Tasarımı Yüksek Lisans Programı
Tez Yöneticisi: Dr. Öğr. Üyesi Semiha Yılmazer

Ağustos 2025

Bu tez, Bilkent Üniversitesi Sağlık Merkezi ve Bilkent Şehir Hastanesi Onkoloji Polikliniği olmak üzere iki farklı sağlık ortamının bekleme alanlarındaki işitsel algılarını karşılaştırmayı amaçlamaktadır. Sağlık merkezi, kampüste küçük bir birim iken, hastane polikliniği büyük ölçekli bir şehir hastanesinin ayakta tedavi birimidir. Çalışma, üniversite sağlık merkezinde 70 kişi ve hastane polikliniğinde 68 kişi olmak üzere toplam 138 katılımcı ile yapılmıştır. Kullanıcı grupları arasında karşılaştırma yapmak amacıyla, katılımcılar hasta, hasta yakınları ve sağlık çalışanlarından oluşturulmuştur. Veriler, ISO/TS 12913-2 standardı Metot A'da belirlenen anket aracılığıyla sahada toplanmıştır. A-Ağırlıklı Eşdeğer Ses Düzeyleri (LAeq) ölçümleri de sağlık mekanlarında yoğun kullanım saatlerinde ölçülmüştür. Anket verileri IBM SPSS 27.0 İstatistik yazılım programı kullanılarak analiz edilmiştir. Toplanan verilerin anlamlı farklılıkları parametrik olmayan testler (Kruskal–Wallis ve Mann–Whitney U) ile test edilmiştir. Korelasyon analizleri ise Spearman's Rho testi ile incelenmiştir. Sonuçlar, insan kaynaklı seslerin her iki sağlık ortamında da en baskın ses kaynağı olduğunu göstermiştir. Bu kaynak tüm kullanıcı grupları tarafından da aynı şekilde tanımlanmıştır. Algılanan Duygusal Nitelik (PAQ) sonuçlarına göre,

üniversite sağlık merkezi kayda değer derecede daha tekdüze, sakin ve canlı olarak algılanırken, hastane polikliniği daha rahatsız edici ve kargaşalı olarak değerlendirilmiştir. Sağlık merkezinde, sağlık çalışanları ses manzarasını hastalar ve hasta yakınlarına kıyasla kayda değer derecede daha canlı olarak algılarken, hastane polikliniğinde kullanıcı grupları arasında kayda değer bir fark bulunmamıştır. Ayrıca, sağlık merkezindeki ses ortamı hastane polikliniğindeki ses ortamına göre katılımcılar tarafından daha uygun (appropriateness) bulunmuştur. Korelasyon analizi her iki bekleme alanındaki ses ortamına maruz kalış süresi arttıkça negatif algının artma eğiliminde olduğunu ve bu algıların hastane polikliniğinde daha fazla olduğunu göstermiştir. Bu sonuçlar, iki ortam arasındaki çevresel farklılıkların kullanıcıların işitsel algılarını nasıl şekillendirdiğini vurgulamıştır ve farklı kullanıcı gruplarının aynı ortamı farklı şekillerde algılayabileceğini göstermiştir.

Anahtar Kelimeler: Ses Manzarası Algısı, İşitsel Algı, Sağlık Ortamları, Akustik Ortam Kullanıcı Deneyimi

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LIST OF ABBREVIATIONS

dB	Decibel
dBA	A-weighted decibels
C50	Speech clarity (0–50 ms / >50 ms energy ratio)
C80	Music clarity (0–80 ms / >80 ms energy ratio)
ISO	International Organization for Standardization
LAeq	Equivalent continuous A-weighted sound level
LAmin	A-weighted minimum sound level
LAmax	A-weighted maximum sound level
LCpeak	C-weighted, peak, sound level
PCA	Principal Component Analysis
RT	Reverberation time
RT30	Reverberation time, the first 30 dB of sound decay
STI	Speech Transmission Index
SPL	Sound Pressure Level
PCA	Principal Component Analysis
WSP	World Soundscape Project

CHAPTER I

INTRODUCTION

The concept of soundscape introduces a perceptual perspective to acoustic research. This perspective originated with Schafer (1977) and was later formalized in ISO 12913-1 Standard (2014). Instead of relying solely on physical measurements in healthcare studies (Casey et al., 2020; Song et al., 2022), the soundscape approach focuses on people's subjective experience of the acoustic environment. This approach is particularly valuable in healthcare settings where sound is rated as the most significant stressor (Krampe et al., 2021). Studies have shown that the acoustic environment in hospitals can influence patients' recovery and staff performance (Awada et al., 2021; Moon et al., 2021). Healthcare settings include a variety of spaces, such as inpatient wards, emergency departments, outpatient clinics, and waiting areas. These spaces are designed for different functions and user needs, considering acoustic requirements and expectations. A university health center usually serves fewer people in a quieter and more manageable environment, while a city hospital polyclinic is typically more crowded and has a more complex layout. Previous research has shown that environmental context, including the activity levels, acoustic and visual conditions, can significantly affect how users perceive the

acoustic environment (Okcu et al.,2011). These environments are shared by different user groups. Healthcare staff use them as workspaces, patients for treatment and recovery, and accompanying relatives for support. Therefore, soundscape perceptions may vary depending on the functional role of the user within the same environment. These considerations emphasize the importance of exploring soundscape perception in different healthcare environments and among different user groups. Previous research has primarily focused on critical healthcare settings, with patients often being the only user group examined (Mackrill et al., 2014; Bliefnick et al., 2019; Louwers et al., 2024). Despite the growing interest in healthcare soundscapes, research comparing different outpatient settings and the perceptions of multiple user groups remains limited.

1.1. Aim and Scope

This study aims to compare soundscape perceptions in the waiting areas of two outpatient healthcare settings, the Bilkent University Health Center and the Bilkent City Hospital Oncology Polyclinic. By examining these two distinct environments, the study seeks to understand are differences in spatial scale and environmental context influence users' auditory experiences. In addition to comparing the two settings, the study further explores differences in soundscape perceptions among user groups, patients, their relatives, and healthcare staff, including doctors and nurses, within each setting.

The study uses ISO/TS 12913-2:2018 Method A, a standardized questionnaire to collect subjective data on soundscape perception. The questionnaire included a Turkish-translated version of the Perceived Affective Quality (PAQ) attributes (Yılmazer et al., 2023). Objective acoustic measurements were also conducted in situ using the Brüel & Kjær 2230 sound level meter to obtain equivalent continuous A-weighted sound levels (LAeq). The questionnaire data were analyzed using IBM SPSS Statistics software. The analysis involved descriptive statistics, non-parametric tests, and correlation analyses. By adopting a quantitative approach in real healthcare environments, this research aims to contribute to the literature on soundscape studies across different outpatient settings and user groups.

1.2. Thesis Structure

This thesis consists of six chapters. The first chapter, Introduction, presents the research topic, the aim and scope, and the structure of the thesis. Chapter II, Literature Review, introduces the concept of the acoustic environment in healthcare settings by giving its characteristics and impact on users. It continues with the development of the soundscape approach, followed by a review of previous studies on indoor soundscapes. The chapter then focuses on soundscape perception research conducted in healthcare environments. The chapter concludes with a description of the ISO 12913 Standard series, which provides the conceptual and methodological basis for soundscape research. Chapter III presents the Method of the study. It describes the research design and introduces the research questions guiding the study. The chapter explains the study settings and the demographic information on the participant groups. Data collection procedures are described, including a questionnaire survey and LAeq measurements. The final part of the chapter details the statistical analysis techniques applied to the questionnaire data. Chapter IV, Results, presents the findings of the statistical analysis and LAeq measurements. The results are structured in line with the questionnaire content and are supported by LAeq measurements conducted in both settings. Differences between the two settings and among user groups are examined, and correlations between perceptual and contextual variables are also explored. Chapter V, Discussion, provides a critical interpretation of the findings presented in the previous chapter. The results are discussed within the context of the two healthcare settings studied and with existing indoor soundscape literature. The discussion follows the structure of the results, covering themes derived from the questionnaire. The final chapter of the thesis, Chapter VI, Conclusion, summarizes the main findings of the study. It provides outcomes for designers aiming to enhance user experiences in outpatient settings. The chapter also considers the limitations that may have affected the findings and provides directions for future studies to build on the findings of this research.

CHAPTER II

LITERATURE REVIEW

This chapter reviews the literature relevant to the acoustic environment and soundscape research, focusing on healthcare settings. It first examines the concept of the acoustic environment and key objective parameters in indoor spaces. Next, the soundscape approach is introduced, including the historical background and standardized evaluation methods. Finally, previous studies on indoor and healthcare soundscapes are reviewed.

2.1. Acoustic Environment in Healthcare Settings

The acoustic environment of a place refers to the sound from all sources that can be heard by someone in that location. It is shaped by the presence of various sound sources and their interactions through reflection and absorption (Brown et al., 2016). The “acoustic environment” has been defined using various terminologies, such as the “sonic environment” (Schafer, 1997) and the “sound environment” (Yang & Kang, 2005). It has also been described as “existing within an environment of sound” (Truax, 1999) or as an “aural space” (Schulte-Fortkamp & Lercher, 2003), emphasizing the engagement with auditory surroundings. To understand the sound sources and composition of the acoustic environment, Brown et al. (2011) proposed a

taxonomy (Figure 1). Illustrated taxonomy categorizes the acoustic environment into two primary groups. These are the indoor acoustic environment and the outdoor acoustic environment. The outdoor acoustic environment has four subcategories, which are urban, rural, wilderness, and underwater. The same classification is applied to the indoor acoustic environment as to the outdoor environment.

The quality of an indoor acoustic environment depends on several acoustical parameters. These shape the comfort and functionality of the built environments, where acoustic quality is prioritized based on the purpose of the space. For example, in educational settings, speech intelligibility, reverberation time, background noise, and sound levels have been studied (Tang & Yeung, 2006; Zannin & Zwirtes, 2009; John et al., 2016). In office environments, background noise levels and reverberation times are particularly important, as they directly influence occupants' ability to concentrate (Balazova et al., 2008). In restaurants and other social spaces, acoustic comfort is maintained through sound absorption by controlling reverberation time and background noise levels (Rindel, 2019).

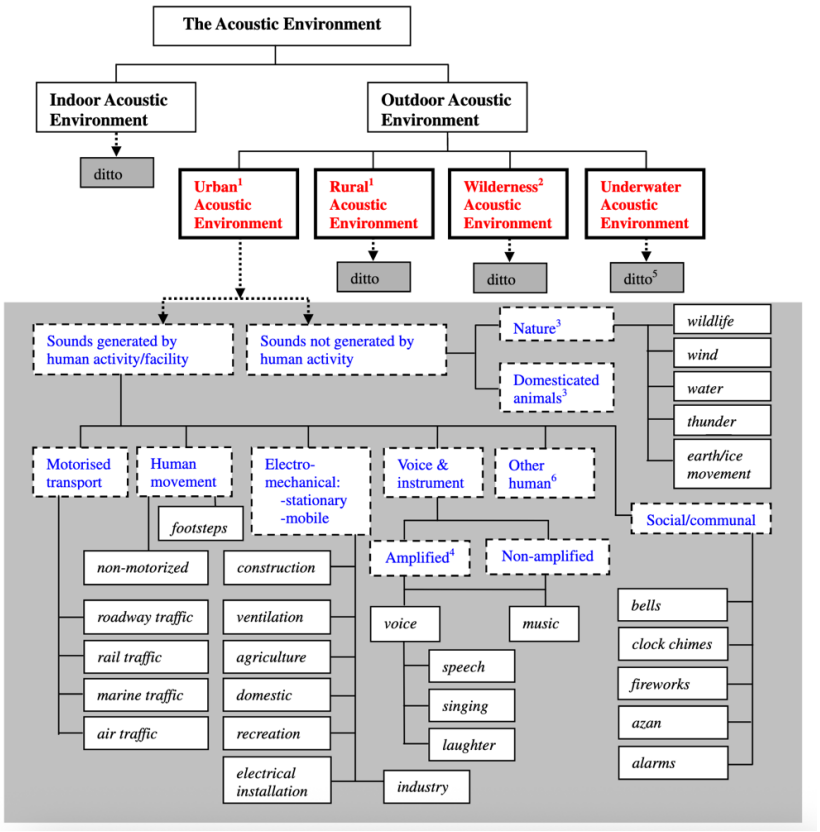

Figure 1. Taxonomy of the acoustic environment for soundscape studies (Brown et al., 2011)

A commonly used parameter, the equivalent continuous sound level (LAeq) is used to describe the overall sound level of an environment. LAeq represents the constant sound level that would deliver the same acoustic energy as the actual fluctuating A-weighted sound signal over time (Brüel & Kjær, n.d.). It is measured in decibels (dB) using a sound level meter. The A-weighting filter mimics the human ear's sensitivity to very low and very high frequencies (Egan, 1988). Previous studies have used LAeq measurements in combination with subjective assessments to examine the relationship between measured sound levels and perceived sound quality, such as in educational spaces (Çankaya Topak and Yılmazer, 2022; Acun and Yılmazer, 2018b), in residential buildings (Torresin et al., 2020), office environments (Acun and Yılmazer, 2018a), urban contexts (Aletta et al., 2019), and healthcare facilities (Watts et al., 2016; Uğurlu, 2022).

Among the various indoor environments, healthcare settings present a particular challenge, as studies have shown that environmental stressors play a significant role in human health (Monti et al., 2012). Noise is a significant factor that shapes how users perceive and experience healthcare spaces (Ulrich et al., 2008). The role of noise in healthcare settings has been emphasized by Florence Nightingale, who described unnecessary noise as a lack of care. (Nightingale, 1969; Biley, 1994). Despite developments in technologies and the implementation of regulations (Berglund et al., 1999; Rasmussen et al., 2021), noise levels have continued to increase over the years in hospitals (Busch-Vishniac, 2019; de Lima Andrade et al., 2021). To improve acoustic conditions in healthcare settings, the World Health Organization (WHO) introduced recommended noise level limits, LAeq below 35 dBA during the day, LAeq below 30 dBA at night, and LAMax below 40 dBA during nighttime hours (WHO, 1999).

Hospital noise is a common complaint among patients, staff, and visitors (Turner et al., 1975; Baker, 1984; Krampe et al., 2021), due to high background noise and lack of speech privacy (Xyrichis et al., 2018; Awada et al., 2021; Dawson et al., 2019). Exposure to high noise levels in hospital settings is linked to increased stress among healthcare workers, negatively affecting their psychological well-being (Moon et al., 2021), and this chronic stress among medical staff can lower the care quality and intensify burnout (McCullagh et al., 2021). In addition, patients, who are often

physically and mentally vulnerable and lack coping mechanisms, are more likely to be disturbed by hospital noise (Lam et al., 2022). These effects include sleep disturbances and stress responses that can reduce overall well-being and impact recovery (Xyrichis et al., 2018; Awada et al., 2021; Basner et al., 2014; Park et al., 2014). To understand these auditory challenges, previous studies have largely focused on objective acoustic measurements of acoustic environments in various healthcare units, such as intensive care units (ICUs) (Akansel & Kaymakci, 2008; Anand et al., 2009), inpatient hospital wards (Shield et al., 2016), and emergency departments (Mahapatra, 2011). Although objective measurements of the acoustic environment provide valuable data, they represent only one dimension of the experience. Lower sound levels do not necessarily lead to an improved acoustic environment (Lam et al.,2022). To fully understand how individuals perceive sound, it is essential to consider contextual factors and acknowledge their potential contribution to human health (Axelsson et al., 2010; Orhan & Yilmazer, 2021).

2.2. Soundscape Approach

The concept of "soundscape" can be traced back to the late 1960s, with the pioneering work of Canadian composer and theorist R. Murray Schafer. Schafer was concerned about the growing problem of noise pollution in Vancouver. In response, he founded the World Soundscape Project (WSP) at Simon Fraser University in 1972. It is supported by the Canadian government and collaboration from researchers such as Barry Truax and Hildegard Westerkamp. This initiative was the beginning of soundscape research. It also played a role in establishing acoustic ecology as a recognized academic field. In his book The Tuning of the World, Schafer (1977) described the soundscape as the acoustic environment as perceived and interpreted by individuals by emphasizing the importance of the listener's experience and the cultural meanings of sounds.

Schafer introduced key classifications to describe the structure and perception of soundscapes. He identified three fundamental elements: keynote sounds, which are ambient background sounds shaped by the environment and often perceived unconsciously; signals, which are intentional foreground sounds that attract attention; and soundmarks, which are distinctive and locally meaningful sounds that contribute to the acoustic identity of a place. In addition, he categorized environmental sounds

into geophony (natural sounds) and anthrophony (human-made sounds), emphasizing the diverse origins of acoustic stimuli in everyday settings. To describe the overall quality of acoustic environments, Schafer also proposed the concepts of high-fidelity (hi-fi) and low-fidelity (lo-fi) soundscapes. Hi-fi environments, such as rural or cultural settings, are characterized by low ambient noise and clear acoustics. It allows individual sounds to be easily distinguished. In contrast, lo-fi soundscapes are typically found in urban or commercial areas and contain overlapping sounds that reduce perceptual clarity.

The concept of soundscape has expanded its roots in music, acoustic ecology, and early urban design theories and gained relevance in fields such as social sciences, environmental psychology, and engineering (Kang et al., 2016). One widely cited definition by Truax (1999), found in the Handbook for Acoustic Ecology, describes soundscape as “an environment of sound or sonic environment with emphasis on the way it is perceived and understood by the individual, or by a society.” In 2014, the International Organization for Standardization (ISO) published ISO 12913-1, the first part of a soundscape standard series that provides a definition and a conceptual framework for soundscape research. The ISO 12913-1 standard defines soundscape as “the acoustic environment as perceived or experienced and/or understood by a person or people, in context” (ISO, 2014). This definition underlines that the soundscape is shaped by perception and context. This emphasis on perception aligns with the framework proposed by ISO 12913-1 (Figure 2). The framework comprises seven interrelated elements: context, sound sources, acoustic environment, auditory sensation, interpretation of auditory sensation, responses, and outcomes. The model's core is “context,” which shapes how sound is produced, perceived, and evaluated. Sound sources interact with the acoustic environment through physical features such as reverberation, while individuals perceive and interpret these sounds based on cultural or emotional contexts. These interpretations lead to outcomes that may further influence the environment and its perception over time. The soundscape approach emphasizes the human understanding of sound, not constructed from the sound energy but from how individuals engage with it (Brooks et al., 2014; Kang et al., 2017; Yang & Kang, 2013).

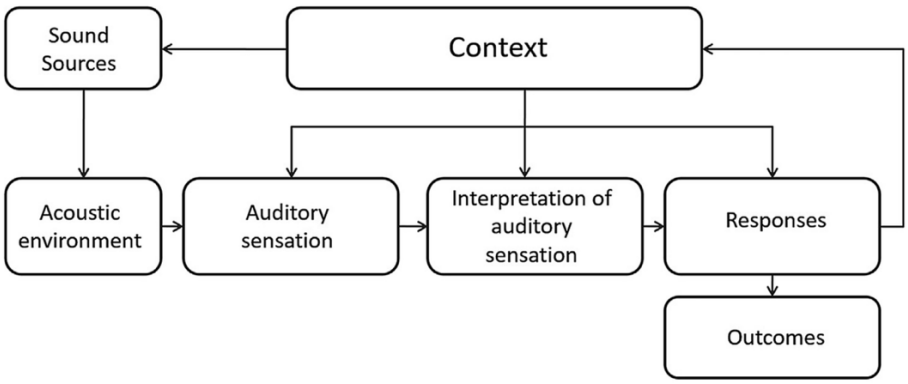

Figure 2. Soundscape Framework (ISO/TS 12913-1, 2014)

2.2.1. Previous Studies in Indoor Soundscape

Initial soundscape research mainly concentrated on outdoor urban areas (Hong & Jeon, 2013; Jennings & Cain, 2013; Raimbault & Dubois, 2005; Yong Jeon et al., 2013). However, the focus has expanded to indoor settings such as healthcare, educational, religious, and cultural spaces, emphasizing that sound is a fundamental component of spatial experience in all types of built environments (Aletta & Astolfi, 2018; Torresin et al., 2019; Ercakmak & Dokmeci Yorukoglu, 2019; Aletta et al., 2025). Among early attempts to conceptualize indoor soundscapes, Dokmeci & Kang (2010) developed an indoor soundscape framework that includes the sound environment, the built space, and contextual experience. Unlike outdoor models, it emphasizes how architectural factors like function, layout, and indoor conditions shape sound perception in indoor spaces.

Indoor soundscape research has been conducted across a variety of settings, including office environments. Acun & Yılmazer (2018a) aimed to explore how employees perceive the acoustic environment in open-plan offices and to identify the contextual factors that influence these perceptions. The study used a qualitative method, conducting semi-structured interviews with 28 participants across three different open office layouts. Data were analyzed using Grounded Theory to develop a conceptual model. The findings revealed that employees' perception of soundscapes is shaped not only by acoustic conditions but also by factors like spatial layout, task type, and user expectations. Approaching the topic from an experimental perspective, Jo & Jeon (2022) investigated how different audio-visual characteristics in open-plan offices affect perceived affective quality, satisfaction, and productivity.

They conducted two virtual laboratory experiments with 75 participants in total. The method involved questionnaires to assess satisfaction, perceived productivity, and affective responses. Results showed that environments with low acoustic and visual complexity were generally perceived as more comfortable and less distracting. The study revealed that natural sounds and simple visuals improved comfort and productivity. It demonstrated the importance of the audio-visual design in offices.

Soundscape research in cultural and religious indoor spaces has examined how spatial and visual factors shape users' acoustic experiences. Yılmazer & Acun (2018) studied the indoor soundscape perception in historic Anatolian mosques. They used a qualitative method. Semi-structured interviews were conducted with 42 participants. Results showed that speech intelligibility and reverberation influenced perceived tranquility and appropriateness of the space. Reverberation and architectural harmony were generally viewed as enhancing spiritual experience, while external sounds were perceived as disruptive. Museum settings have also been studied with a similar focus. Acun & Yılmazer (2019) explored how visitors perceive sound in a historical museum. They used a mixed-method approach. First, they developed a conceptual model through Grounded Theory based on 22 interviews. Then, they tested it with SEM using survey data from 271 participants. Findings showed that spatial experience, visual evaluation, and perceived control strongly influenced acoustic comfort. Another museum-based study further emphasized the role of visual and spatial features. Orhan & Yılmazer (2021) explored how visitors perceive a museum environment within Ankara Erimtan Archeology and Arts Museum. The study used semi-structured interviews with 21 participants and followed the Grounded Theory method. Results showed that visual stimuli and environmental expectations strongly influenced the perceived acoustic quality. For example, integrating natural materials and simple exhibits contributed to a sense of calm, while background noise was tolerated when perceived as appropriate to the context. The study concluded that indoor cultural spaces' audio-visual harmony significantly shapes the visitor experience.

Soundscape research in residential settings has focused on how people evaluate everyday indoor sounds. Torresin et al. (2020) aimed to develop a perceptual model of indoor soundscape experiences in residential buildings. A principal components

analysis (PCA) was conducted. Questionnaire data were collected from 161 residents from various Italian dwellings. The PCA revealed three main dimensions of perception: comfort, annoyance, and engagement. The study emphasized that even in relatively quiet indoor environments, the type of sound source, such as neighbors, traffic, and household appliances, was a predictor of how the environment was evaluated. Torresin et al. (2023) extended their work by testing indoor soundscape assessment in two different countries (Italy and Sweden) to examine the cross-cultural context. The study used a quantitative questionnaire-based approach with 96 participants. They collected both subjective evaluations (perceived comfort, appropriateness) and objective acoustic measurements (LAeq, reverberation time). Statistical analyses compared the results between contexts. The study confirmed that sound source appropriateness predicted the acoustic environment better than sound levels. It also showed that similar sound levels were perceived differently based on context and user expectations.

In addition, Yılmazer & Erdoğu (2021) studied the geometry of the concert hall. They compared the indoor soundscape perception between the CSO Concert Hall (shoebox form) and the CSO Grand Hall (vineyard form). A remote listening test was conducted with 40 participants using 4-minute audio recordings and visuals of each space. Participants evaluated the soundscapes using an ISO/TS 12913-2-based questionnaire survey. Results showed that the Grand Hall was perceived as more pleasant, eventful, and appropriate. These perceptions aligned with its higher T30 and C80 values, suggesting that geometric form significantly affects soundscape quality.

There has been a growing focus on educational environments in indoor soundscapes studies. Çankaya Topak & Yılmazer (2022) conducted a comparative soundscape study in a high school environment. The study explores how space type and acoustic conditions affect students' auditory perception. The research used a mixed-method approach. They combined questionnaire surveys with semi-structured interviews, binaural recordings, and acoustic measurements (LAeq, T30, STI). Two spaces, a classroom and a computer lab, were compared. Results showed that students' responses varied based on the function of the space, lecture content, and task type. The study proposed a conceptual framework linking the built environment, acoustic

characteristics, and student perception. Similar concerns were addressed by Visentin et al. (2023), who explored the relationship between acoustic parameters and perceived soundscape quality in primary school classrooms in Italy. The study aimed to identify which physical acoustic variables could predict perceived appropriateness and comfort. Using a quantitative method, the researchers measured reverberation time (RT), LAeq, and speech clarity (C50). Researchers collected subjective evaluations from students using ISO/TS 12913-2-based questionnaires in 15 classrooms. Statistical analyses showed that lower RT and higher C50 were significantly correlated with positive evaluations of the sound environment. The study demonstrated that beyond objective metrics, the perceived appropriateness of the acoustic environment influences sound perception. Expanding the scope of research, Kurukose Çal et al. (2025) conducted a large-scale cross-sectional survey to assess teachers' perception of indoor and outdoor soundscapes in primary schools across the UK. The study targeted over 4,000 educators. They collected data through an online questionnaire. It included perceived comfort, sound source dominance, and context-based appropriateness. The method focused on descriptive and correlation-based analysis. Results demonstrated that indoor acoustic environments were evaluated as inadequate, especially in classrooms with external noise sources. Teachers also reported higher levels of annoyance and lower comfort indoors compared to outdoor school environments.

Studies have also addressed library and semi-public environments. Xiao & Aletta (2016) conducted a field study to assess indoor soundscape perception within a library. They utilized a user-centered soundscape approach. The study involved architecture students performing soundwalks on four different floors of the library. For each floor, they measured LAeq, identified dominant sound sources, and completed questionnaires focusing on perceived sound quality and appropriateness. Although the measured LAeq values were relatively consistent across the library, the perceived acoustic comfort changed depending on the spatial function. The study concluded that user expectations and the functional context of space strongly influence soundscape perception.

As a contribution to soundscape methodology, Dokmeci Yorukoglu & Kang (2017) aimed to develop a specialized soundscape questionnaire that could evaluate users'

contextual experience in indoor environments. The study built upon prior theoretical frameworks (Dokmeci & Kang, 2010). It focused on integrating physical acoustic data with subjective perception. The proposed questionnaire was tested in various indoor locations using a mixed-method approach. It included in-situ sound pressure level measurements and surveys. Findings demonstrated that perceived comfort was shaped not only by sound levels but also by contextual elements such as the activity type, spatial layout, and social expectations. Overall, previous studies on indoor soundscapes consistently convey the same conclusion.

2.2.2. Soundscape Perception in Healthcare Environments

Healthcare facilities include diverse settings that are designed to support both patients' healing and staff performance. These outcomes are influenced by various indoor stimuli, including the acoustic environment (Ackley et al., 2024). Soundscape research in healthcare environments explores how people perceive the acoustic environment, considering both objective and subjective factors. This approach emphasizes users' contextual experiences of sound. Soundscape research in healthcare environments has been studied in various settings, including hospital polyclinic areas (Dalirnahadeh & Yilmazer, 2022; Uğurlu, 2022; Alimadhi & Yılmazer, 2025), patient rooms and nursing stations (Bliefnick et al., 2019), hospital wards (Mackrill et al., 2013; Mackrill et al., 2014), dental clinics (Uğurlu & Yılmazer, 2021), student healthcare settings (Watts et al., 2016), elderly care facilities (Long et al., 2023), nursing homes (Aletta et al., 2018), and more sensitive environments like ICUs (Okcu et al., 2011; Orhan & Yilmazer, 2021; Louwers et al., 2024).. In addition, research has also examined the perception differences among user groups, including patients, staff, and visitors (Lam et al., 2022).

Recent studies have explored the soundscape perception in hospital polyclinics. Dalirnaghadeh and Yilmazer (2022) examined how the sound environment affects learning spatial characteristics in a virtual outpatient polyclinic. The study employed an experimental design with 80 participants. They were assigned to four conditions (control, visual-only, audio-only, and audio-visual). A virtual model of a real oncology polyclinic was developed, and environmental sounds were recorded. Visual cues included signage and spatial layout, while audio cues consisted of human-based sounds and equipment noise. Participants were asked to complete landmark

recognition and route reproduction tasks after exploring the virtual environment. Results showed that combining sound and visual improved spatial understanding the most. The audio-only condition also led to better performance compared to the visual-only group. In contrast, the control group performed the worst across all measures. These findings emphasize the importance of auditory landmarks in healthcare navigation, particularly in settings where visual information is limited.

In addition to virtual exploration of outpatient environments, a recent study by Uğurlu (2022) focused on audio-visual characteristics that shape users' perceptual evaluations. The study investigated the audio-visual perception in an oncology polyclinic using a mixed-method approach. Quantitative methods included binaural sound recordings, signal processing, and 360° image analysis, while qualitative data were collected through semi-structured interviews. The research focused on three distinct areas within the polyclinic. There were the reception, courtyard, and corridor waiting areas. The acoustic data were processed to generate spectrograms, while image analysis focused on spatial openness. 120 individuals participated in the study, including 13 patients who participated in the interview phase. Method A of ISO/TS 12913-2 was employed to collect subjective data, including perceived affective quality and overall environmental assessment. The findings revealed that the courtyard was perceived as significantly more "calm" and "pleasant" than the other areas. This was attributed to its visual openness to greenery and lower sound pressure levels. In addition, human activity and technological sounds were dominant across all spaces. The degree of enclosure and access to outdoor elements also influenced the patients' affective evaluations. Interview transcripts were analyzed using a grounded theory approach. It revealed that patient comfort was related to the visual and acoustic elements. Suggesting that both sensory dimensions play roles in shaping user experience in a healthcare setting

Building on this, Alimadhi and Yılmazer (2025) conducted a multi-domain assessment based on the Biophilia Hypothesis. The aim is to evaluate the influence of biophilic design on audio-visual perception and psychological restoration in oncology waiting areas. The study was conducted at Ankara City Oncology Hospital and utilized field- and laboratory-based experiments. Two waiting areas within the hospital were selected based on their contrasting biophilic content. One has access to

natural views, natural-themed artwork, and a courtyard, while the other has minimal biophilic elements. Quantitative data collection included ISO/TS 12913-2 Method A questionnaires for perceived affective quality and environment assessment, as well as psychological restoration scales. In the laboratory phase, participants were exposed to immersive 360° video and spatial audio recordings representing each setting. A total of 136 participants took part in the study, including 68 participants in the field phase and 68 in the laboratory phase. The results revealed that biophilic elements were found to enhance perceived environmental quality, particularly in visual terms. However, the auditory environment in both settings was consistently described as "annoying," "eventful," and "chaotic." Despite variations in visual biophilic quality, there were no statistically significant differences in soundscape evaluations and psychological restoration scores. This outcome indicates that visual interventions alone may not suffice to mitigate the negative impact of hospital noise.

Bliefnick et al. (2019) conducted a comparative soundscape study of two different patient room types. These were single-bed and multi-bedroom rooms in a medical-surgical unit of a hospital. The study aimed to assess how spatial layout influences patients' auditory experiences and acoustic comfort. Quantitative data were gathered through sound level measurements (LAeq, LAmin, LAmax) and patient surveys, while qualitative data were obtained from open-ended responses. The results showed that patients in single bedrooms generally perceived the sound environment as more private and less chaotic. In contrast, multi-bedroom occupants reported higher annoyance levels due to speech and activity sounds from other patients. While LAeq and LCpeak showed no correlation with patient perceptions, lower LAmin values (below 35 dBA) were significantly associated with "quietness" ratings. These findings emphasize that patient perception of acoustic comfort is influenced not only by decibel levels but also by sound predictability and control. The results suggest architectural design could enhance soundscape quality and overall patient well-being in clinical environments.

Earlier work by Mackrill et al. (2013) conducted semi-structured interviews with patients and nurses in a cardiothoracic ward. The aim is to explore subjective experiences of hospital soundscapes. The study adopted a mixed-methods approach, combining qualitative interviews with quantitative sound level measurements. The

findings showed that perceptions of the acoustic environment were linked to emotional, spatial, and contextual factors. Participants identified both positive and negative aspects in the sound environment and often developed coping strategies. The authors proposed a conceptual framework to improve perceived soundscapes. It emphasized the need for both physical and cognitive interventions. According to the findings, reducing noise alone may not be sufficient to enhance user experience.

Following their earlier investigation of hospital soundscapes, Mackrill et al. (2014) examined how positive auditory interventions could enhance user experiences in hospitals. The study employed qualitative methods, including focus groups and listening sessions. The participant group consisted of patients and healthcare staff. Participants were exposed to a range of sound recordings such as birdsong, running water, and music. They evaluated their affective responses and preferences. Results indicated that natural sounds were consistently rated as more comforting and restorative compared to artificial or mechanical sounds. For example, birdsong and water sounds were associated with reduced stress and greater emotional comfort. The study emphasized that sound interventions could provide a supportive and healing acoustic environment. These findings support the integration of sound design into hospital design to enhance overall patient well-being and staff satisfaction.

As an example of a multi-sensory intervention study, Watts et al. (2016) investigated the effects of natural sound and landscape imagery in a student health center waiting area. The study employed a mixed-method experimental design to test four different audio-visual conditions: a control room with standard furnishings and no added sound, and three intervention rooms featuring naturalistic visual and auditory elements. A total of 91 student participants were randomly assigned to one of the four conditions. They were asked to complete the questionnaire measures anxiety levels and a perceived tranquility scale. The results showed that the room with both natural sounds and landscape imagery was rated significantly higher in perceived tranquility compared to the control. However, changes in anxiety levels were not statistically significant across conditions. These findings suggest that multi-sensory environmental modifications can enhance perceived tranquility in healthcare settings.

To assess user-based soundscape perceptions in a large hospital setting, Lam et al. (2022) assessed perceived acoustic environment quality in a tertiary-care hospital in

Singapore. The study used a psychometric questionnaire based on ISO 12913-2. It included responses from three groups: patients, visitors, and healthcare staff. Data collected from six indoor healthcare spaces across outpatient and inpatient departments. Participants evaluated aspects such as noise annoyance, privacy, and the appropriateness of the acoustic environment. The results indicated that all groups were most dissatisfied with noise levels and sound privacy. Staff reported significantly higher annoyance toward vocal and operational sounds compared to patients and visitors. Moreover, staff also rated the acoustic appropriateness of the environment lower than the other groups. The study questioned the suitability of tools like the Weinstein Noise Sensitivity Scale and ISO 12913-3 PAQ model in Asian hospitals. It suggested that these tools may require local adaptation.

Recent studies have also explored the physiological and psychological impacts of soundscape interventions in elderly care environments. Long et al. (2023) investigated the effects of immersive soundscape exposure on the physiological and psychological states of older adults in a nursing home. The study introduced a VR-based intervention in a controlled virtual environment. Participants were exposed to different outdoor soundscapes, including natural, mechanical, and urban sounds. Physiological responses such as heart rate variability (HRV) and skin conductance were measured, along with subjective evaluations of mood and relaxation. Results indicated that natural sounds led to significantly lower stress responses and higher perceived relaxation levels compared to other conditions. These findings suggest that integrating natural sounds through immersive or environmental design strategies may provide restorative benefits in elderly care settings.

Continuing with studies focusing on critical care environments, Louwers et al. (2024) investigated ICU patients' perceptions of their sound environment and its influence on rest and recovery. They conducted a mixed-methods study to explore how patients perceive the soundscape of single-patient ICU rooms. A total of 26 patients who had recently stayed in single-patient ICU rooms participated in semi-structured interviews. They also completed questionnaires five days after discharge. Interviews were thematically analyzed by labeling sound-related experiences, sounds, and emotions. Participants also rated one selected experience using a need fulfillment questionnaire and the PANAS-SF scale. Findings showed that patients experienced

both positive and negative aspects of the ICU soundscape. While human presence and certain medical sounds provided comfort, alarms and unclear conversations were found to be disruptive. The absence of meaningful sounds also led to feelings of isolation.

Orhan & Yılmazer (2024) investigated soundscape perceptions in a neonatal intensive care unit (NICU). The study used a grounded theory and ISO 12913-2/3 Standards. Semi-structured interviews were conducted with ten healthcare staff members to explore how they interpret and evaluate the NICU sound environment. Findings revealed that staff considered many sounds, such as equipment alarms and ventilators, to be essential for patient care. However, their acoustic properties, like high pitch and repetition, caused stress and distraction during long shifts. Other sounds, such as staff conversations and baby cries, were interpreted differently depending on context and workload. Sometimes those sounds were perceived as neutral or even positive when indicating normal activity. The findings emphasized that staff perceptions were influenced more by the contextual meaning and purpose of sounds than by their measured loudness.

In addition to quantitative approaches, creative and participatory methods have been used in hospital soundscapes research. Bates et al. (2022) adopted an arts-based participatory method to explore patients' and healthcare professionals' perceptions of hospital soundscapes. The study involved line-drawing workshops where participants visually represented their auditory experiences in different hospital spaces. Each participant responded to the sounds by making lines that captured their emotional and sensory reactions. These drawings were thematically analyzed to identify patterns. Results showed that patients often found hospital sounds distracting or uncomfortable, particularly when they were resting or receiving treatment. These findings suggest that traditional acoustic assessments may not be sufficient to understand the experience of sound in hospitals.

2.2.3. ISO/TS 12913-2:2018- Data Collection and Reporting Methods

The ISO/TS 12913-2:2018 technical specification proposed three standardized methods for assessing soundscape perception in context: Method A, a questionnaire-based survey; Method B, a soundwalk; and Method C, semi-structured guided

interviews. ISO/TS (2018) allows researchers to add additional questions related to the context, select or combine methods based on the study objectives the characteristics of the research environment. The acoustic environment should be documented by including details such as the identified sound sources, weather conditions, the time of day and year, the specific measurement locations, and the measured acoustic parameters, such as LAeq.

2.2.3.1. Overview of Standardized ISO Methods: Method A, B, C

Method A involves a structured questionnaire that captures individuals' perception of the acoustic environment through four key dimensions: sound source dominance, perceived affective quality (PAQ), overall evaluation of the sound environment, and its appropriateness for the setting. Each component was evaluated using a five-point Likert scale. The Sound Source Dominance section asks participants to rate the prominence of various auditory elements. It is categorized as technological sounds, human-based sounds, or environmental noise, with responses ranging from "Not at all" to "Dominates completely." The Soundscape Perceived Affective Quality (PAQ) section includes eight bipolar adjective pairs, which are pleasant–annoying, calm–chaotic, and monotonous–vibrant. To facilitate the interpretation of these affective qualities, a circumplex model based on the two-dimensional model of pleasantness and eventfulness was proposed (Axelsson et al., 2010) and later standardized (ISO 12913-3, 2019). These two primary axes are arranged perpendicularly to form a circumplex structure, from which four diagonal affective labels are derived. An environment that is both pleasant and eventful is described as vibrant, one that is pleasant and uneventful as calm, eventful and unpleasant as chaotic, and uneventful and unpleasant as monotonous. This model enables a structured interpretation of how users perceive the sound environment across emotional and contextual dimensions. The part asks participants to rate their agreement with eight descriptive adjectives on a scale from "Strongly Disagree" to "Strongly Agree." These ratings are often visualized using radar charts to provide a graphical representation of the perceived soundscape characteristics. The last parts of the questionnaire are the Assessment of Sound Environment and Appropriateness of the Sound Environment. Participants rated Assessment of Sound Environment on a five-point scale ranging from "Very Bad" to "Very Good", and Appropriateness of the Sound Environment on a scale from "Not at all" to "Perfectly".

Method B is known as the soundwalk, in which participants follow a predefined route and stop at specific locations to evaluate the acoustic environment in situ. At each listening point, they are asked to attentively listen to their surroundings and provide perceptual evaluations. This method comprises three main components. In the first part, participants assess the acoustic environment in situ by rating perceptual attributes such as loudness, unpleasantness, contextual appropriateness, and their willingness to return to the space. The second part focuses on sound source identification and ranking. Here, participants list and rank the most dominant sounds they perceive in the environment. The third part collects open-ended reflections, where participants articulate their immediate emotional responses, associations, or thoughts about the sound environment at each listening stop.

Method C employs semi-structured interviews to collect qualitative data on participants' auditory experiences. Unlike Methods A and B, Method C allows researchers to generate their questions according to the specific context of the study. ISO/TS 12913-2:2018 provides a set of example questions that can be modified based on the context. However, the standard also acknowledges that not all questions may be appropriate for every context and that new questions may naturally emerge during the interview process. The open-ended questions enable participants to reflect on their perceptions without scales. According to ISO/TS 12913-3:2019, data collected through Method C are typically analyzed using qualitative methods such as Grounded Theory. It helps identify themes and patterns in participants' responses.

2.2.3.2. Applications of ISO Methods in Soundscape Research

These standardized methods have been adopted in various studies investigating soundscapes in indoor and urban contexts. Method C, guided by Grounded Theory, was applied in both open-plan offices (Acun and Yılmazer, 2018a) and a historical museum context (Acun and Yılmazer, 2019) to develop conceptual models of indoor soundscape perception. Çankaya Topak and Yılmazer (2022) utilized a mixed-method approach combining Method A and Method C, aiming to understand students' auditory perception in educational spaces. Similarly, Uğurlu (2022) integrated Method A and Method C by applying questionnaires and semi-structured interviews to oncology outpatients. Alimadhi and Yılmazer (2025) applied Method A in field and laboratory settings. Likewise, Visentin et al. (2023) explored the indoor

soundscape in primary school classrooms through Method A questionnaire. These examples demonstrate how ISO/TS 12913-2:2018's methodological framework can be implemented in different spatial contexts to assess users' auditory experience in the built environment.

An important contribution to evaluating these methods in practice was made by Aletta et al. (2019), who explored the compatibility of Method A and Method B during a soundwalk on a university campus. Participants were divided into two groups, applying each method separately but in identical locations. Their findings showed a strong statistical correlation between the results of the two methods, particularly in categorizing soundscapes as positive or negative. This suggests that Method A and Method B can be used interchangeably or in combination. However, the authors found that the two methods sometimes classified the same soundscape differently. This indicates that the two methods, despite their similarities, are not fully aligned. The study emphasizes the importance of ISO standards. It also calls for further research on integrating the methods. This is particularly relevant in complex real-world environments with multiple interacting perceptual dimensions.

CHAPTER III

METHOD

This chapter presents the methodological approach of the study. It includes the research design and questions, descriptions of the study sites, participant groups, and characteristics of the acoustic and visual environments. The chapter also explains the data collection and analysis procedures, incorporating both subjective evaluations through questionnaires and objective acoustic measurements.

3.1. Design of the Study

This study compares the soundscape perception of patients, patients' relatives, and healthcare staff in two different healthcare settings, focusing on the waiting areas of the Health Center at Bilkent University and the Oncology Polyclinic at Bilkent City Hospital. These facilities were selected due to their contrasting scales and environmental complexity. The oncology polyclinic represents a typical outpatient environment within a large-scale city hospital. The specific waiting area was selected based on the previous research on the hospital soundscape (Uğurlu, 2022; Alimadhi & Yılmazer, 2025). On the other hand, the university health center serves as a smaller, campus-based facility, offering a comparative setting with a different

architectural and acoustic context. Since healthcare environments serve multiple user groups, this study examines the soundscape perceptions of patients, patients' relatives, and healthcare staff regarding the auditory environment. Patients and their relatives experience the soundscape during waiting, whereas healthcare staff are continuously exposed to it throughout their shifts. Comparing these groups allows for an analysis of how occupational roles and exposure times influence soundscape perception.

A quantitative method is employed to understand soundscape perception, incorporating subjective and objective data collection methods. Subjective evaluations are gathered through a structured questionnaire based on ISO/TS 12913-2 Method A. Objective acoustic measures include sound pressure level (SPL) measurements. The method follows the research design demonstrated in Figure 3, including measurement, instruments, measured variables, and data analysis tools. The same methodological approach was applied in both healthcare settings to ensure data collection and analysis consistency.

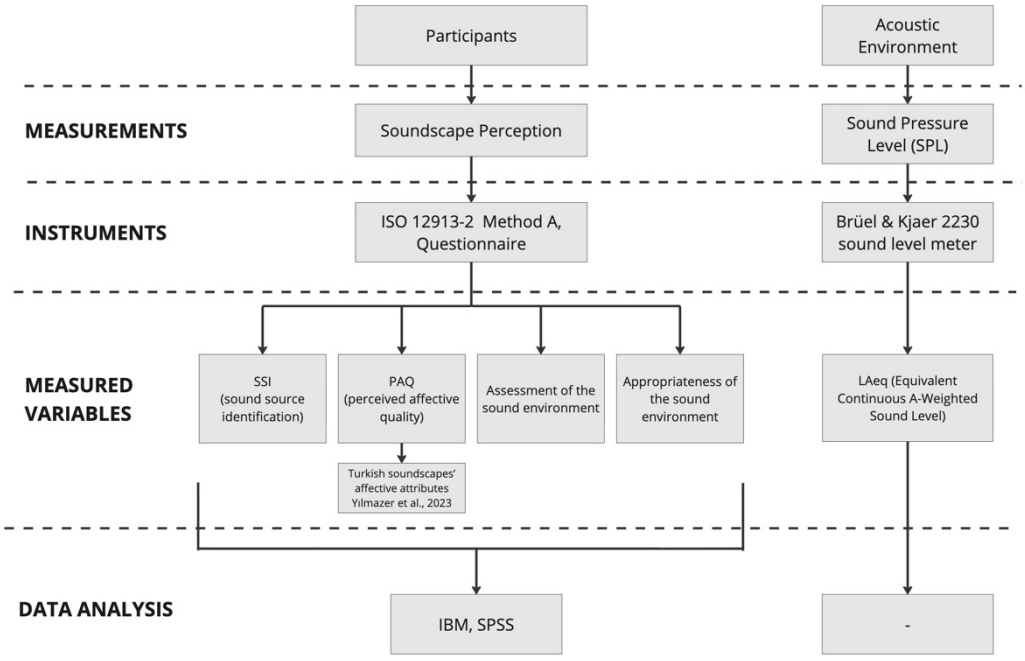

Figure 3. Research design of the study

3.1.1. Research question

The study addresses the following research question:

1. What are the differences in soundscape perception between the Bilkent University Health Center and the Bilkent City Hospital Oncology Polyclinic?
2. How do patients, patients' relatives, and healthcare staff perceive the soundscape within different healthcare settings?

Hypotheses:

1. The soundscape in the Bilkent University Health Center is evaluated more positively than the Bilkent City Hospital Oncology Polyclinic.
2. Healthcare staff perceive the overall sound environment more negatively than patients and patients' relatives in both settings.

These hypotheses were shaped by insights from a pilot study, where the Health Center was evaluated more positively, and staff in both settings tended to report more negative perceptions.

3.2. Method

3.2.2. Research Settings

3.2.2.1. Bilkent University Health Center

The study was conducted in the Health Center on the main campus of Bilkent University in Ankara, Türkiye. The health center provides outpatient healthcare services mainly to students, faculty, and administrative staff. It is a small-scale facility located near faculty buildings and pedestrian paths. As shown in Figure 4, the center is easily accessible from many parts of the campus. A café is located next to the building, and students commonly use nearby outdoor areas. Ethical approval for this setting was obtained from the Bilkent University Human Research Ethics Committee with Approval No: E-19220902-600.605-67033 (Appendix A). The study followed the ethical principles in the Declaration of Helsinki.

The total area of the health center is about 121.5 m². The waiting area, which is the focus of this study, covers 24.3 m². The health center includes a reception near the

entrance, examination rooms, doctors' offices, and a waiting area (Figure 5). The waiting area connects directly to other functional spaces.

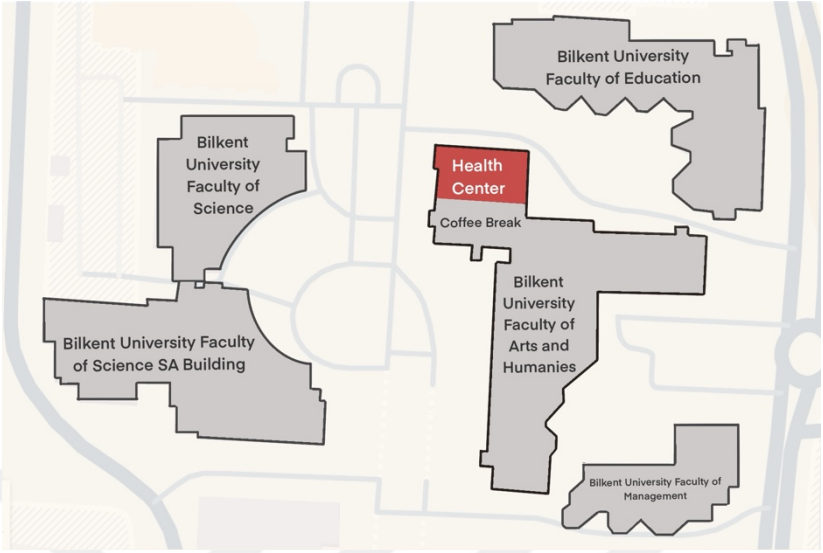

Figure 4. Site Plan of the Bilkent University Health Center

The patient flow follows a structured process. Patients first register at the reception desk, where their information is recorded. Next, they are directed to the pre-examination room for initial assessment. Then they are sent to the doctor's office for consultation and evaluation. Patients and their relatives spend time in the waiting area between these stages, and while waiting for the test results. This space is also occasionally used by healthcare staff for short breaks between appointments.

It is furnished with simple seating along the walls, which patients and visitors use. There are no windows, and natural light enters only through the glass entrance door. Artificial lighting is the primary source of light. The walls are neutral in color, and the floor is covered with ceramic tiles. Human-based sounds shape the acoustic environment, such as conversations, footsteps, and interactions at the reception desk. Background sounds include door movements and the telephone ringing. Classical music was occasionally played in the background, adding an auditory element to the space. Additionally, environmental sound sources from the adjacent café, campus gathering areas, and pedestrian movement slightly contribute to the overall auditory environment. Traffic noise does not significantly contribute to the overall soundscape due to its distance from roads.

Figure 5. Floor plan of the Bilkent University Health Center

3.2.2.2. Ankara Bilkent City Hospital Oncology Polyclinic

Bilkent City Hospital is a large healthcare complex located in Ankara. The hospital has been operational since 2019 and consists of eight specialized buildings coded M1 to M6 (Figure 6). Buildings are designated for different medical fields, including cardiology, pediatrics, general medicine, obstetrics, gynecology, neurology, oncology, rehabilitation, and the main hospital building. The Oncology Polyclinic, where this study is conducted, is located within the Oncology Hospital (MH6). It provides outpatient services primarily for patients undergoing cancer treatment. The Research Ethics Committee of Ankara Bilkent City Hospital approved this part of the study with Approval No: E2-25-9881 (Appendix B).

The polyclinic is on the second basement level of the Oncology Hospital. It includes examination rooms for medical oncology, as well as areas for algology and geriatrics, all connected to shared waiting spaces (Figure 7). The reception area, which is the focal point of this study, is located at the polyclinic's entrance. As in the university health center, it is directly next to the registration desk, where patients check in and receive their appointment numbers. The size of the waiting area is approximately 92 m².

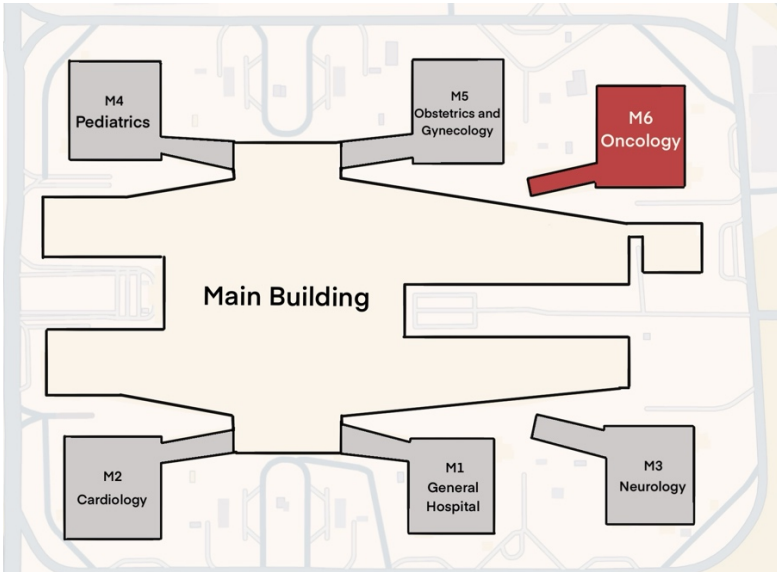

Figure 6. Site plan of the Oncology Building at Bilkent City Hospital

Patients follow a process starting with obtaining approval from their assigned doctor, after which they proceed to the reception desk to complete their registration and receive an appointment number. They then wait in the reception area until their number is called for consultation. Healthcare staff also pass through the area. Staff movement increases around midday during the lunch break, 12:00–13:30, within the hospital's working hours of 08:00–12:00 and 13:30–16:30 on weekdays.

Seating in the waiting area is arranged in rows, facing digital display screens that show queue numbers and are located near the corridors that lead to consultation rooms. The space does not receive direct natural daylight; instead, a limited view of a small courtyard is available through nearby internal openings. The interior design features neutral-colored walls, with a navy-blue wall behind the reception desk, and the flooring is vinyl. Nature-themed paintings on the walls contribute to the visual setting. Artificial lighting is the main source of illumination in the space.

Compared to other polyclinic areas, where medical equipment contributes to the acoustic environment, the Oncology Polyclinic reception area lacks such technological sound sources and alarm sounds. Instead, the dominant auditory elements are from human interaction. The space was expected to have lower noise levels due to the nature of oncology patients, who are often fatigued from treatment. However, the waiting area is audibly active, with constant speech, movement, and administrative activity.

Figure 7. Floor plan of the Oncology Outpatient Polyclinic

3.2.2. Participants

The study included 138 participants, with 70 individuals recruited from the Bilkent University Health Center and 68 from the Oncology Polyclinic at Bilkent City Hospital (Table 1). In the health center sample, 27 participants (38.6%) were male and 43 (61.4%) were female. Their ages ranged from 18 to 63, with a median age of 23. In the hospital setting, the gender distribution was equal, with 34 males (50%) and 34 females (50%). Participants in this group were between 21 and 68, and the median age was 41. All participants were native Turkish speakers.

Table 1. Age and gender distributions of participants by setting and user Groups (n=138)

	Gender	Age Median	Age Min-Max	Patients	Relatives	Staff	Total
The Health Center	Male: 27 (38.6%) Female: 43 (61.4%)	23	18- 63	38	21	11	70
The Hospital Polyclinic	Male: 34 (50%) Female: 34 (50%)	41	21- 68	21	32	15	68
Total	Male: 61 (44.2%) Female: 77 (55.8)	-	-	59	53	26	138

Patients, patients' relatives, and healthcare staff (doctors and nurses) were the three main user groups in the sample. Overall, 59 were patients, 53 were relatives, and 26 were healthcare staff. The health center had 38 patients, 21 relatives, and 11 staff members. In the hospital polyclinic, the participant group included 21 patients, 32 relatives, and 15 staff.

3.2.3. Data Collection

3.2.3.1 Questionnaire Survey

Data was collected using a questionnaire following ISO/TS 12913-2 Method A to evaluate soundscape perception. The same questionnaire was used in both healthcare settings. Figure 8 explains the research procedure of the questionnaire process that was used, including the number of participants, user groups, and statistical analyses conducted. The questionnaire was administered in Turkish (Appendix C), following previous soundscape studies conducted in Türkiye (Orhan & Yılmazer, 2021; Uğurlu, 2022), including PAQ adjectives adapted to the Turkish context based on ISO 12913-2 (Yılmazer et al., 2023). The questionnaire in English is available in Appendix D.

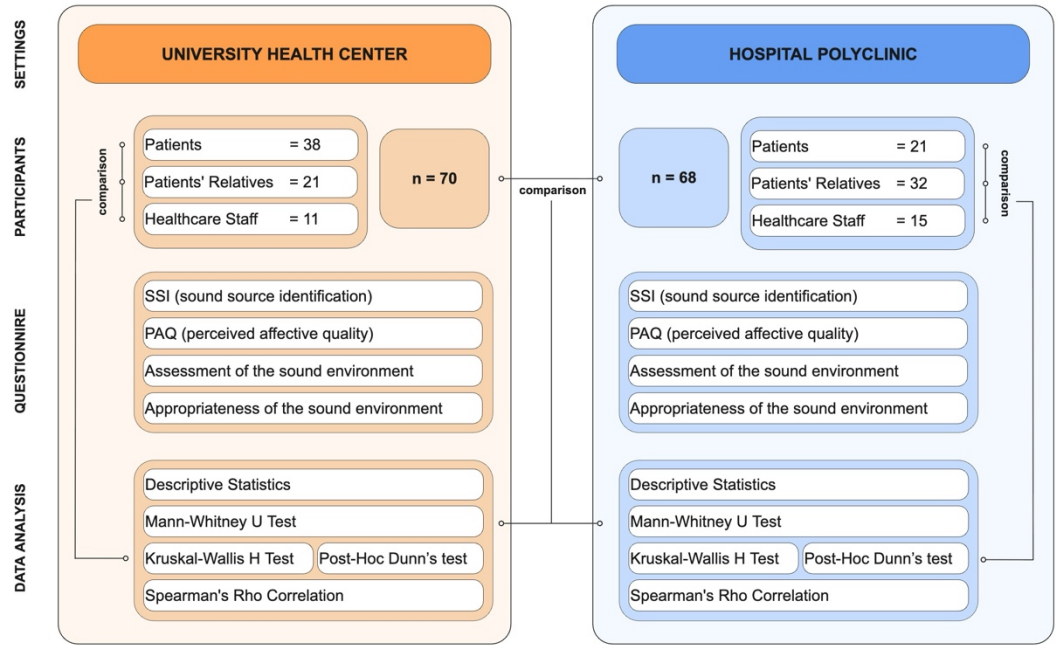

Figure 8. Research procedure by healthcare setting

Eligibility criteria included being over 18 years of age, present in the waiting area, and having no reported hearing impairments. Prior to completing the questionnaire, participants were clearly informed about the objective of the research. It was emphasized that their involvement was completely voluntary, and they were assured that they could withdraw from participation at any time or choose not to respond to specific items they found intrusive or uncomfortable. Anonymity and confidentiality of their responses were also guaranteed.

The questionnaire consists of two main sections. The first section collects demographic and background information, including age, gender, frequency of visits, and the purpose of being in the waiting area. The second section evaluates four factors related to the soundscape on a Likert scale as reviewed in the literature. ISO/TS (2018) states that additional questions relevant to the study context can be added to the questionnaire. Therefore, three components related to visual perception were incorporated into the ISO 12913-2 Method A questionnaire. Participants evaluated Visual Appropriateness from "Not at all" to "Perfectly" and Visual Assessment from "Very Good" to "Very Bad." The final component, Audio-Visual Quality, assessed the overall perception of sound and visual environment, using a scale from "Not at all" to "Perfectly."

3.2.3.1 Equivalent Continuous A-Weighted Sound Level (LAeq) Measurements

LAeq measurements were conducted for the objective assessment of the acoustic environment in both waiting areas. Measurements were taken using a Brüel & Kjær Hand-held Analyzer Type 2230. The sound level meter was placed at a height of 1.5 meters in the center of the waiting area, following ISO/TS 12913-3 guidelines. There was no audible noise either from outdoor sources or caused by weather conditions in both settings. Measurements were conducted under mild and partly cloudy weather conditions. Dominant sounds included human conversation, footsteps, and short administrative interactions. Since the variety and intensity of sound sources did not change significantly over time, measurements were taken at one-hour intervals, and the mean values were considered for evaluation.

At the Bilkent University Health Center, LAeq measurements were taken between 10:30 and 13:30. Among the weekdays, daily user density was observed to be irregular.

The selected hour represents the peak occupancy period of the waiting area. It also overlaps with students' and staff's lunch breaks.

At the Oncology Polyclinic of Ankara Bilkent City Hospital, LAeq measurements were taken between 09:00 and 12:00 on a weekday. During this period, most patients arrive and wait for their appointments. In the afternoon hours, patients from the morning often remain in the waiting area, and the overall activity level tends to decline. Therefore, the selected time was considered the most active period in the outpatient clinic.

3.2.4. Data Analysis

Data analysis was conducted using IBM SPSS Statistics 27.0. The dataset was first reviewed for missing values, which accounted for less than 3% of the total responses. No imputation was performed, as this level of data loss is generally considered negligible. (Little & Rubin, 2019). The normality of the data was assessed through the Shapiro–Wilk test. It resulted in the data not being normally distributed across all questionnaire components in both settings. Accordingly, non-parametric tests were employed for statistical analysis. All inferential analyses were conducted using a significance threshold of $p < 0.05$ to determine statistically significant differences across variables.

Reliability analysis was conducted using Cronbach's alpha, which yielded values of 0.769 for the University Health Center and 0.792 for the Hospital Polyclinic. For inferential analysis, the Mann-Whitney U Test was applied to compare the two healthcare settings. The differences among user groups (patients, relatives, and healthcare staff) were examined using the Kruskal-Wallis H Test. When significant differences were found, Dunn's Test was conducted as a post-hoc analysis. In addition, Spearman's Rho correlation analysis was performed to investigate the relationships between duration of stay, assessment of the sound environment, and overall quality of the audio-visual environment and other perceptual variables within each setting. Descriptive statistics were used to calculate mean values for all measured variables. Among these, the PAQ dimensions were visualized using a radar chart. Other variables were presented using bar charts.

CHAPTER IV

RESULTS

This chapter presents the results of the quantitative analyses conducted in this study. It includes the findings of descriptive and inferential statistical tests, along with sound level measurements based on questionnaire data collected in two outpatient healthcare settings. Results are presented by comparing the two settings and examining differences among user groups.

4.1. Questionnaire Survey Results

4.1.1. Sound Source Identification

The evaluation of sound source identification was conducted in the Bilkent University Health Center and the Bilkent City Hospital Oncology Polyclinic. The analysis focused on four main categories of sound, which are Technological, Other, Human, and Natural Sounds. As illustrated in Figure 9, the Human Sounds category emerged as the most dominant sound source category in both settings. (University Health Center: $\mu = 3.53$, SD = 1.04; Hospital Polyclinic: $\mu = 3.91$, SD = 0.94). Technological Sounds followed, with a score of $\mu = 2.99$, SD = 1.14 in the

University Health Center and μ = 2.74, SD = 1.31 in the Hospital Polyclinic. Other Sounds resulted in μ = 1.61, SD = 0.97 in the University Health Center and μ = 1.68, SD = 1.25 in the Hospital Polyclinic. Natural Sounds received the values of μ = 1.83, SD = 1.11, and μ = 1.71, SD = 1.32 for the University Health Center and Hospital Polyclinic, respectively.

To investigate whether there were significant differences between the two healthcare settings, the Mann-Whitney U test was conducted. The results indicated that Human Sounds were significantly more dominant in the Hospital Polyclinic compared to the University Health Center (U = 1903.000, Z = -2.117, p = 0.034) (Table 3). For Technological Sounds, the difference was not statistically significant (U = 2093.500, Z = -1.253, p = 0.210). Similarly, Other Sounds (U = 2250.500, Z = -0.494, p = 0.621) and Natural Sounds (U = 1953.000, Z = -1.948, p = 0.051) did not show a significant difference between the two healthcare settings.

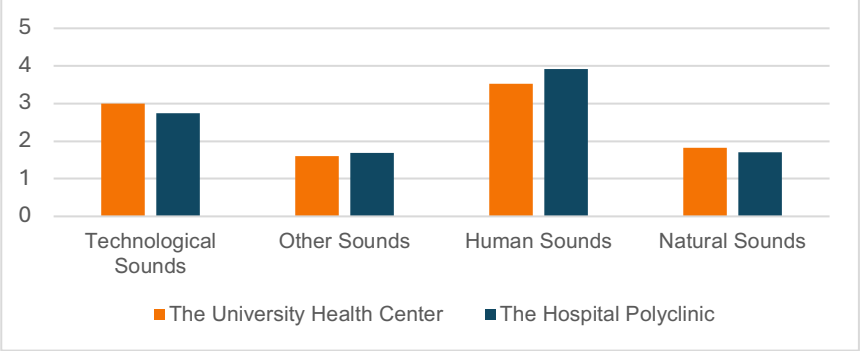

Figure 9. Mean scores of sound source categories in two healthcare settings

Table 2. Descriptive statistics and Mann–Whitney U Test results for sound source identification by setting

Sound Sources	The University Health Center (n=70) μ (SD)	The Hospital Polyclinic (n=68) μ (SD)	Mann-Whitney U Test		
			U Statistics	Z score	P value
Technological Sounds	2.99 (1.14)	2.74 (1.31)	2093.500	-1.253	0.210
Other sounds	1.61 (0.97)	1.68 (1.25)	2250.500	-0.494	0.621
Human Sounds	3.53 (1.04)	3.91 (0.94)	1903.000	-2.117	0.034
Natural Sounds	1.83 (1.11)	1.71 (1.32)	1953.000	-1.948	0.051

To further explore differences in sound source identification between user groups, Kruskal–Wallis tests were conducted separately for each healthcare setting. In the University Health Center, statistically significant differences among patients, patients' relatives, and healthcare staff were found for Technological Sounds, Other Sounds, and Natural Sounds (Table 3). However, post-hoc analysis using Dunnett's Test revealed a statistically significant pairwise difference only between patients and healthcare staff in the Technological Sounds category ($p = 0.005$). No significant pairwise differences were observed for Other or Natural Sounds despite the overall significance in the Kruskal-Wallis results. The mean scores of each user group for the four sound source categories in the University Health Center are illustrated in Figure 10.

In the Hospital Polyclinic, no significant differences were found among user groups for any of the sound source categories (Table 4). Distribution of mean scores is illustrated in Figure 3. User groups show relatively similar patterns for all sound categories.

Table 3. Descriptive statistics and Kruskal–Wallis Test results of sound source identification by user group in the University Health Center

	The University Health Center (n = 70, k = 3)					
	Patients	Patients' Relatives	Healthcare Staff	Kruskal-Wallis H		Dunnett's Test
Sound Sources	(n=21) μ(SD)	(n=32) μ(SD)	(n=15) μ (SD)	H Statistics	P value	Pairwise Comparison
Technological Sounds	2.58 (1.08)	3.24 (0.99)	3.91 (1.04)	12.797	0.002	Patients and Staff (p = 0.005)
Other sounds	1.39 (0.85)	1.67 (0.91)	2.30 (1.25)	8.124	0.017	
Human Sounds	3.39 (1.10)	3.48 (0.98)	4.09 (0.83)	3.773	0.152	
Natural Sounds	1.82 (1.20)	1.62 (0.97)	2.30 (0.94)	6.324	0.042	

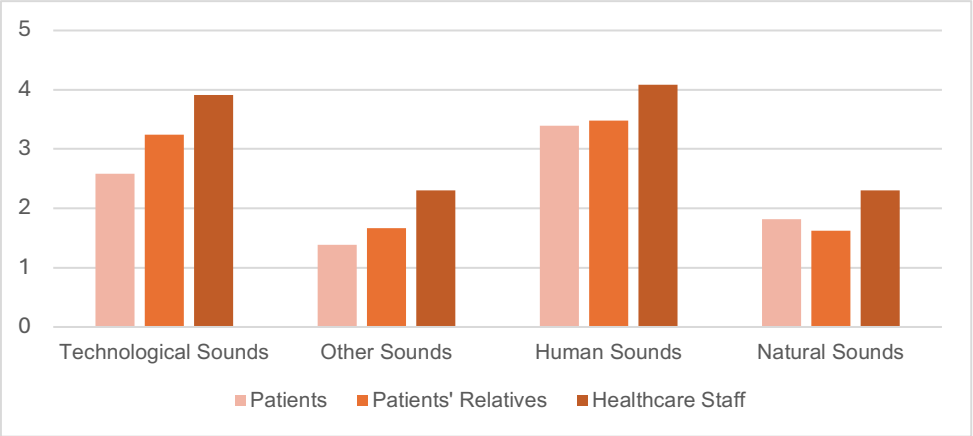

Figure 10. Mean Scores of sound source categories in the University Health Center

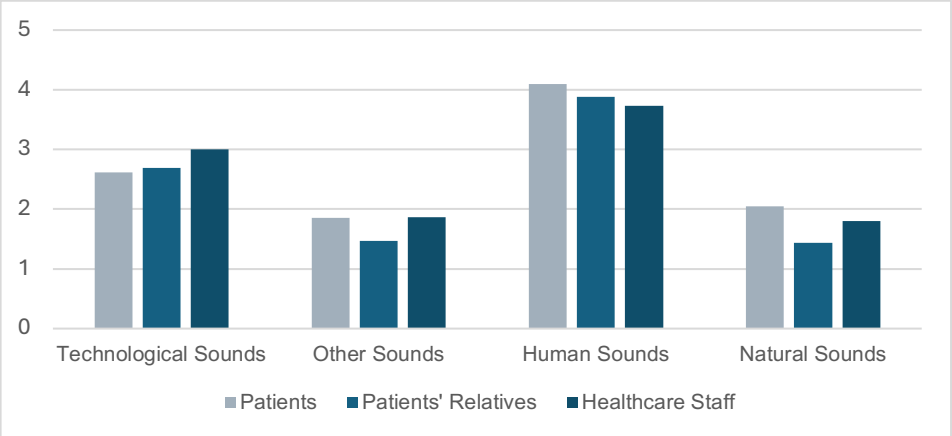

Figure 11. Mean Scores of sound source categories in the Hospital Polyclinic

Table 4. Descriptive statistics and Kruskal–Wallis Test results of sound source identification by user group in the Hospital Polyclinic

Sound Sources	The Hospital Polyclinic (n = 68, k = 3)				
	Patients (n=21) μ (SD)	Patients' Relatives (n=32) μ (SD)	Healthcare Staff (n=15) μ (SD)	Kruskal-Wallis H	
				H Statistics	P value
Technological Sounds	2.62 (1.35)	2.69 (1.30)	3.00 (1.30)	0.867	0.645
Other sounds	1.86 (1.59)	1.47 (0.95)	1.87 (1.30)	0.923	0.630
Human Sounds	4.10 (0.94)	3.88 (0.79)	3.73 (1.22)	1.252	0.535
Natural Sounds	2.05 (1.71)	1.44 (1.01)	1.80 (1.26)	2.257	0.324

4.1.2. Perceived Affective Quality (PAQ)

The Perceived Affective Quality (PAQ) of the acoustic environment was assessed with eight attributes for both the University Health Center and the Hospital Polyclinic. Mean values are presented in Figure 12. The University Health Center was perceived as more Pleasant ($\mu = 2.66$, $SD = 0.91$), Calm ($\mu = 3.31$, $SD = 0.95$), Uneventful ($\mu = 3.43$, $SD = 0.92$), and Vibrant ($\mu = 1.97$, $SD = 1.00$). On the other hand, the Hospital Polyclinic was perceived as more Monotonous ($\mu = 3.52$, $SD = 1.30$), Annoying ($\mu = 3.30$, $SD = 1.24$), Chaotic ($\mu = 3.13$, $SD = 1.16$), and Eventful ($\mu = 3.06$, $SD = 1.19$) than the University Health Center.

Mann-Whitney U test results indicated statistically significant differences between the two settings in six PAQ attributes (Table 5). The University Health Center was rated significantly higher in Pleasant ($U = 1629.000$, $Z = -3.208$, $p = 0.001$), Calm ($U = 1851.500$, $Z = -2.235$, $p = 0.025$), Uneventful ($U = 1807.000$, $Z = -2.427$, $p = 0.015$), and Vibrant ($U = 1788.500$, $Z = -2.604$, $p = 0.009$). In contrast, the Hospital Polyclinic received significantly Annoying ($U = 1584.000$, $Z = -3.404$, $p < 0.001$) and Chaotic ($U = 1604.000$, $Z = -3.308$, $p < 0.001$). No significant differences were observed in the attributes of Monotonous ($U = 2084.500$, $Z = -1.157$, $p = 0.247$) and Eventful ($U = 2248.000$, $Z = -0.434$, $p = 0.664$).

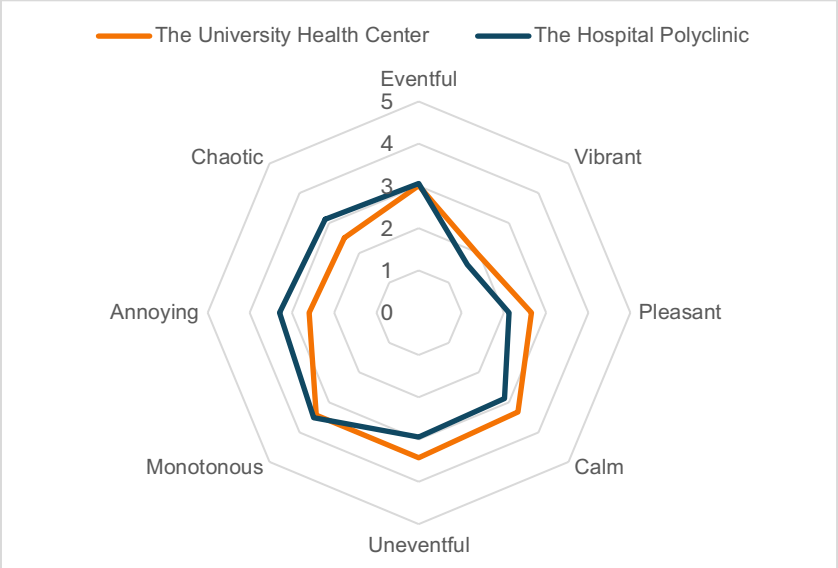

Figure 12. PAQ mean scores of the two healthcare settings

Table 5. PAQ scores and Mann-Whitney U Test results for two healthcare settings

Attributes	The University Health Center (n=70) μ (SD)	The Hospital Polyclinic (n=68) μ (SD)	Mann-Whitney U Test		
			U Statistics	Z score	P value
Pleasant	2.66 (0.91)	2.13 (1.08)	1629.000	-3.208	0.001
Calm	3.31 (0.95)	2.87 (1.20)	1851.500	-2.235	0.025
Uneventful	3.43 (0.92)	2.94 (1.24)	1807.000	-2.427	0.015
Monotonous	3.43 (1.08)	3.52 (1.30)	2084.500	-1.157	0.247
Annoying	2.60 (0.89)	3.30 (1.24)	1584.000	-3.404	<0.001
Chaotic	2.50 (0.98)	3.13 (1.16)	1604.000	-3.308	<0.001
Eventful	3.01 (0.90)	3.06 (1.19)	2248.000	-0.434	0.664
Vibrant	1.97 (1.00)	1.61 (0.96)	1788.500	-2.604	0.009

Perceived Affective Quality (PAQ) attributes were also compared among three user groups within each healthcare setting, including patients, patients' relatives, and healthcare staff. Mean PAQ values by user group are illustrated through a radar chart for the University Health Center (Figure 13). In the University Health Center, significant differences were found for Calm ($H = 9.661$, $p = 0.008$) and Vibrant ($H = 15.949$, $p < 0.001$) attributes (Table 6). Post-hoc analysis revealed that patients ($\mu = 3.55$, $SD = 0.79$) rated the environment as significantly more Calm than healthcare staff ($\mu = 2.45$, $SD = 1.12$; $p = 0.028$). For the attribute Vibrant, healthcare staff ($\mu = 3.18$, $SD = 1.07$) rated the environment as significantly more Vibrant than both patients ($\mu = 1.68$, $SD = 0.77$; $p = 0.003$) and patients' relatives ($\mu = 1.86$, $SD = 0.91$; $p = 0.008$).

In the Hospital Polyclinic, no statistically significant differences were observed among user groups for any of the PAQ attributes (Table 7). Mean scores were generally close for all groups, as shown in the radar chart (Figure 14). For example, for Pleasant, the highest mean was observed among patients ($\mu = 2.52$) and the lowest among healthcare staff ($\mu = 1.67$). For Calm, patients had the highest mean ($\mu = 3.38$), and patients' relatives had the lowest ($\mu = 2.61$). For Vibrant, healthcare staff scored highest ($\mu = 1.73$) while patients' relatives scored lowest ($\mu = 1.48$).

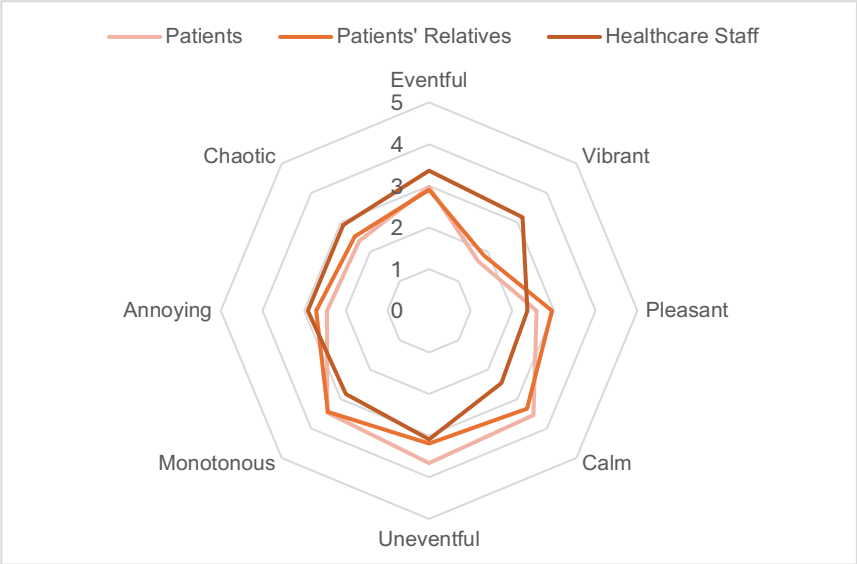

Figure 13. PAQ mean scores in the University Health Center

Table 6. PAQ scores and Kruskal-Wallis H Test results for the University Health Center

Attributes	The University Health Center (n = 70, k = 3)					
	Patients (n=38) μ (SD)	Patients' Relatives (n=21) μ (SD)	Healthcare Staff (n=11) μ (SD)	Kruskal-Wallis H		Dunnett's T3
				H Statistics	P value	Pairwise Comparison
Pleasant	2.58 (0.75)	2.95 (0.86)	2.36 (1.36)	3.111	0.211	
Calm	3.55 (0.79)	3.33 (0.91)	2.45 (1.12)	9.661	0.008	Patients and Staff (p = 0.028)
Uneventful	3.66 (0.81)	3.19 (0.98)	3.09 (1.04)	5.246	0.073	
Monotonous	3.45 (1.03)	3.43 (1.20)	2.82 (0.98)	3.011	0.222	
Annoying	2.45 (0.86)	2.71 (0.95)	2.91 (0.83)	2.627	0.269	
Chaotic	2.37 (0.88)	2.52 (1.25)	2.91 (0.70)	3.492	0.174	
Eventful	2.97 (0.88)	2.90 (1.04)	3.36 (0.67)	2.263	0.323	
Vibrant	1.68 (0.77)	1.86 (0.91)	3.18 (1.07)	15.949	<0.001	Patients and Staff (p = 0.003) Relatives and Staff. (p=0.008)

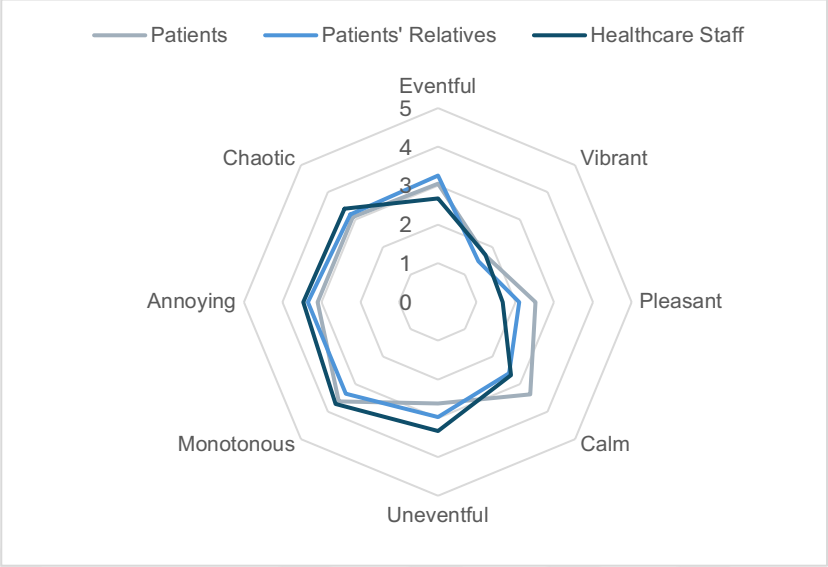

Figure 14. PAQ mean scores in the Hospital Polyclinic

Table 7. PAQ scores and Kruskal-Wallis H Test results for the Hospital Polyclinic

Attributes	The Hospital Polyclinic (n = 68, k = 3)				
	Patients (n=21) μ (SD)	Patients' Relatives (n=32) μ (SD)	Healthcare Staff (n=15) μ (SD)	Kruskal-Wallis H	
				H Statistics	P value
Pleasant	2.52 (1.32)	2.10 (0.94)	1.67 (0.81)	4.378	0.112
Calm	3.38 (1.07)	2.61 (1.11)	2.67 (1.39)	5.628	0.060
Uneventful	2.62 (1.20)	2.97 (1.25)	3.33 (1.23)	3.017	0.221
Monotonous	3.62 (1.11)	3.35 (1.45)	3.73 (1.28)	0.690	0.708
Annoying	3.10 (1.30)	3.35 (1.17)	3.47 (1.35)	1.003	0.606
Chaotic	2.86 (1.10)	3.19 (1.22)	3.40 (1.12)	2.160	0.340
Eventful	3.05 (1.24)	3.26 (1.18)	2.67 (1.11)	2.471	0.291
Vibrant	1.71 (1.23)	1.48 (0.76)	1.73 (0.96)	0.717	0.699

4.1.3. Assessment and Appropriateness of the Sound and Visual Environment

The Assessment and Appropriateness of the Sound and Visual Environment, along with the Overall Audio-Visual Quality, were evaluated based on mean scores for each setting (Figure 15). The Mann-Whitney U Test revealed a statistically significant difference in the Appropriateness of the Sound Environment between the two healthcare settings. The University Health Center had higher mean value (μ = 3.40, SD = 0.69) than the Hospital Polyclinic (μ = 3.16, SD = 1.00; U = 1880.000, p = 0.032) (Table 8).

For the other evaluated measures, no statistically significant differences were found between the two settings. Assessment of the Sound Environment in the University Health Center: μ = 3.20, SD = 0.55; Hospital Polyclinic μ = 3.00, SD = 1.09; U = 1983.000, p = 0.089), Assessment of the Visual Environment (μ = 3.43, SD = 0.79 vs. μ = 3.55, SD = 0.84; U = 2298.500, p = 0.826), Appropriateness of the Visual Environment (μ = 3.47, SD = 0.72 vs. μ = 3.36, SD = 0.89; U = 2175.500, p = 0.429), and Overall Quality of the Audio-Visual Environment (μ = 3.44, SD = 0.67 vs. μ = 3.56, SD = 0.83; U = 2328.500, p = 0.938).

Table 8. Descriptive statistics and Mann–Whitney U test results for sound, visual, and audio-visual assessment by setting

	The University Health Center (n=70) μ (SD)	The Hospital Polyclinic (n=68) μ (SD)	Mann-Whitney U Test		
			U Statistics	Z score	P value
Assessment of the Sound Environment	3.20 (0.55)	3.00 (1.09)	1983.000	-1.699	0.089
Appropriateness of the Sound Environment	3.40 (0.69)	3.16 (1.00)	1880.000	-2.141	0.032
Assessment of the Visual Environment	3.43 (0.79)	3.55 (0.84)	2298.500	-0.220	0.826
Appropriateness of the Visual Environment	3.47 (0.72)	3.36 (0.89)	2175.500	-0.791	0.429
Overall Quality of Audio-Visual Environment	3.44 (0.67)	3.56 (0.83)	2328.500	-0.077	0.938

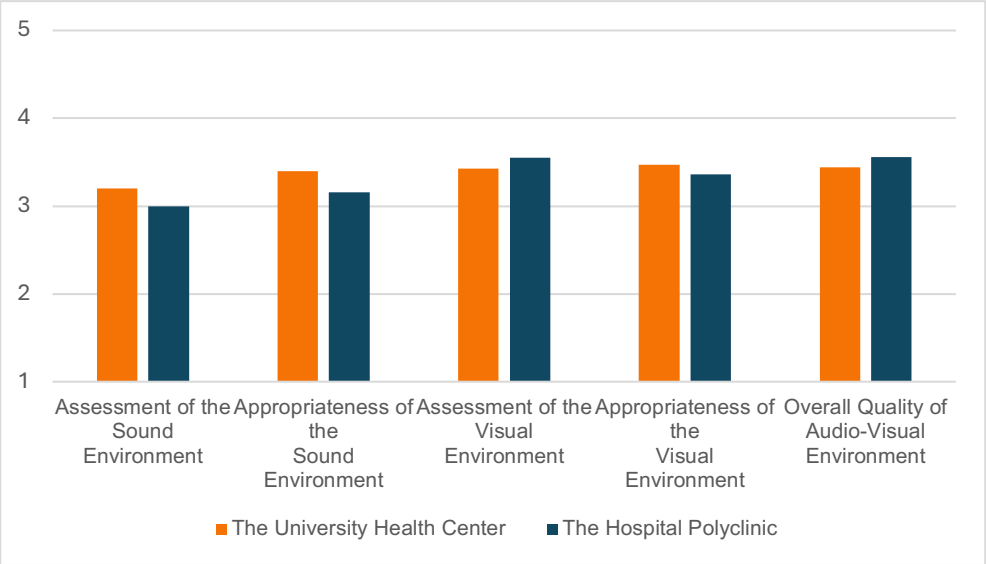

Figure 15. Mean scores of sound, visual, and audio-visual assessment in two healthcare settings

For the University Health Center, the mean scores of patients, relatives, and healthcare staff for sound, visual, and audio-visual assessments are presented in Figure 16. Kruskal-Wallis H Test (Table 9) results showed no statistically significant differences among patients, relatives, and healthcare staff for the Assessment of the Sound Environment ($H = 3.446$, $p = 0.178$), Appropriateness of the Sound Environment ($H = 3.498$, $p = 0.174$), Assessment of the Visual Environment ($H = 1.826$, $p = 0.401$), and Appropriateness of the Visual Environment ($H = 5.655$, $p = 0.059$). However, a significant difference was found for the Overall Quality of the Audio-Visual Environment ($H = 7.585$, $p = 0.023$), with patients rating it higher than relatives ($p = 0.026$).

For the Hospital Polyclinic, the mean score distribution across user groups is shown in Figure 17. The Kruskal-Wallis H Test (Table 10) indicated no statistically significant differences among user groups of the Assessment of the Sound Environment ($H = 4.353$, $p = 0.113$), Assessment of the Visual Environment ($H = 5.414$, $p = 0.067$), or Appropriateness of the Visual Environment ($H = 1.034$, $p = 0.596$). In contrast, a significant difference was found for the Appropriateness of the Sound Environment ($H = 8.048$, $p = 0.018$), with patients' relatives giving lower ratings compared to healthcare staff ($p = 0.016$). A difference was also observed for the Overall Quality of the Audio-Visual Environment ($H = 7.183$, $p = 0.028$). However, the post-hoc comparisons did not reveal statistically significant pairwise differences.

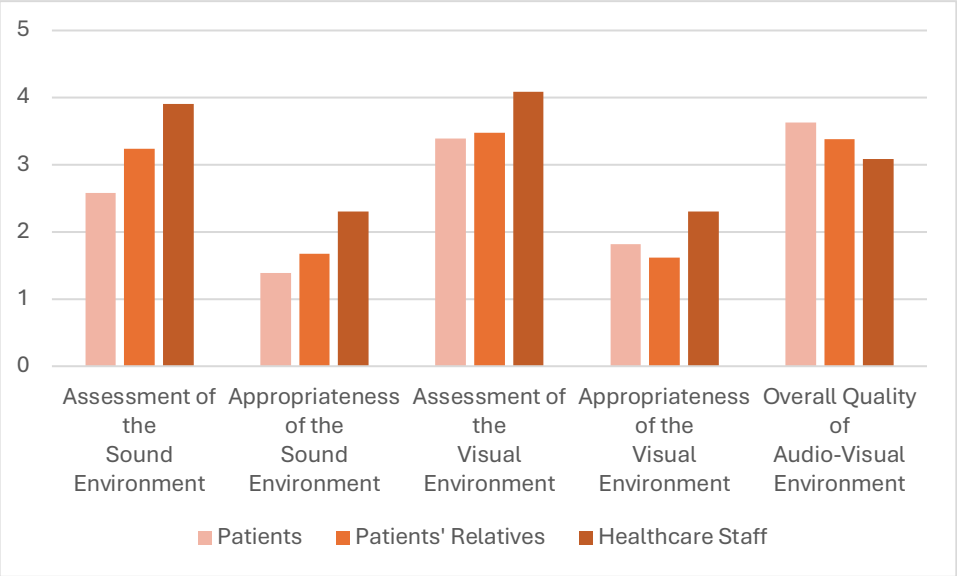

Figure 16. Mean scores of sound, visual, and audio-visual assessment in the University Health Center

Table 9. Descriptive statistics and Kruskal–Wallis Test results for sound, visual, and audio-visual assessment in the University Health Center

	The University Health Center (n = 70, k = 3)					
	Patients (n=21) μ (SD)	Patients' Relatives (n=32) μ (SD)	Healthcare Staff (n=15) μ (SD)	Kruskal-Wallis H		Dunnett's T3
				H Statistics	P value	Pairwise Comparison
Assessment of the Sound Environment	2.58 (1.08)	3.24 (0.99)	3.91 (1.04)	3.446	0.178	
Appropriateness of the Sound Environment	1.39 (0.85)	1.67 (0.91)	2.30 (1.25)	3.498	0.174	
Assessment of the Visual Environment	3.39 (1.10)	3.48 (0.98)	4.09 (0.83)	1.826	0.401	
Appropriateness of the Visual Environment	1.82 (1.20)	1.62 (0.97)	2.30 (0.94)	5.655	0.059	
Overall Quality of Audio-Visual Environment	3.63 (0.63)	3.38 (0.80)	3.09 (0.70)	7.585	0.023	Patients and Relatives (p = 0.026)

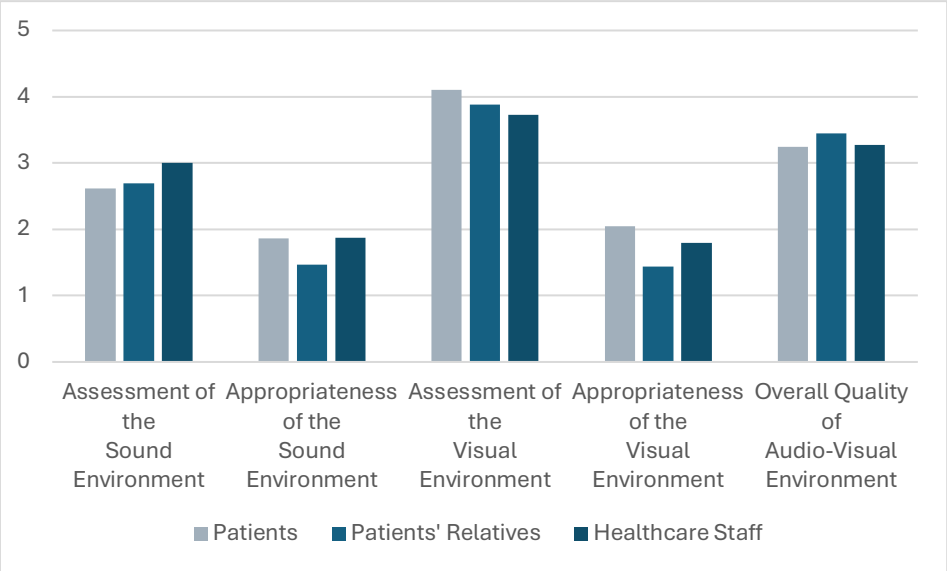

Figure 17. Mean scores of sound, visual, and audio-visual assessment in the Hospital Polyclinic

Table 10. Descriptive statistics and Kruskal–Wallis Test results for sound, visual, and audio-visual assessment in the Hospital Polyclinic

	The Hospital Polyclinic (n = 68, k = 3)					
	Patients (n=21) μ (SD)	Patients' Relatives (n=32) μ (SD)	Healthcare Staff (n=15) μ (SD)	Kruskal-Wallis H		Dunnett's T3
				H Statistics	P value	Pairwise Comparison
Assessment of the Sound Environment	2.62 (1.35)	2.69 (1.30)	3.00 (1.30)	4.353	0.113	
Appropriateness of the Sound Environment	1.86 (1.59)	1.47 (0.95)	1.87 (1.30)	8.048	0.018	Relatives and Staff (p = 0.016)
Assessment of the Visual Environment	4.10 (0.94)	3.88 (0.79)	3.73 (1.22)	5.414	0.067	
Appropriateness of the Visual Environment	2.05 (1.71)	1.44 (1.01)	1.80 (1.26)	1.034	0.596	
Overall Quality of Audio-Visual Environment	3.24 (0.99)	3.45 (0.85)	3.27 (0.88)	7.183	0.028	

4.1.3. Relationships Between Perceptual Variables

To further examine the relationships between perceptual variables, Spearman's Rho correlation analysis was conducted for the University Health Center and the Hospital Polyclinic. Spearman's Rho correlation analysis was conducted at the 95% confidence level using a two-tailed test. Three key perception indicators, duration of stay, assessment of the surrounding sound environment, and overall audio-visual quality, were selected as dependent variables to identify statistically significant correlations. Positive correlations indicate that as one variable increases, the other tends to increase, whereas negative correlations indicate that as one variable increases, the other tends to decrease.

Table 11 presents the significant Spearman's Rho correlations with duration of stay in two healthcare settings. In both settings, a strong negative correlation was found between duration of stay and frequency of visiting (Health Center: $r_s = –0.437$, $p < 0.001$; Hospital Polyclinic: $r_s = –0.670$, $p < 0.001$), suggesting that less frequent visitors tended to spend more time in the waiting areas. In the University Health Center, longer stays were correlated with a stronger presence of technological sounds ($r_s = 0.252$, $p = 0.038$) and human sounds ($r_s = 0.308$, $p = 0.011$). Additionally, the attribute vibrant showed a positive correlation with duration of stay ($r_s = 0.411$, $p = 0.028$), while negative correlations were found with calm ($r_s = –0.294$, $p = 0.015$), uneventful ($r_s = –0.290$, $p = 0.017$), and assessment of the sound environment ($r_s = –0.267$, $p = 0.028$) appropriateness of the visual environment ($r_s = –0.305$, $p = 0.011$), and overall audio-visual quality ($r_s = –0.241$, $p = 0.048$). These results suggest that participants who stayed longer tended to experience the environment as more vibrant, less calming, and uneventful in the Bilkent University Health Center.

In the Hospital Polyclinic, longer stays positively correlated with annoying attribute ($r_s = 0.302$, $p = 0.020$), while negatively with pleasant ($r_s = –0.451$, $p < 0.001$), eventful ($r_s = –0.325$, $p = 0.012$), overall quality of the audio-visual environment ($r_s = –0.363$, $p = 0.005$), and assessment of the sound environment ($r_s = –0.361$, $p = 0.005$). Additionally, negative correlations were found with appropriateness of the sound environment ($r_s = –0.273$, $p = 0.036$), assessment of the visual environment ($r_s = –0.341$, $p = 0.008$), and audio-visual quality ($r_s = –0.363$, $p = 0.005$). Meaning, increased annoyance, reduced pleasantness, and eventfulness with longer stays.

Table 11. Significant Spearman's Rho correlations between duration of stay and measured variables

Items	The Health Center		The Hospital Polyclinic	
	rs	P value	rs	P value
Frequency of visiting	**-0.437**	**<0.001**	**-0.670**	**<0.001**
Technological device sounds	**0.252**	**0.038**	0.002	0.988
Human sounds	**0.308**	**0.011**	0.022	0.867
Pleasant	-0.007	0.953	**-0.451**	**<0.001**
Calm	**-0.294**	**0.015**	-0.198	0.133
Uneventful	**-0.290**	**0.017**	0.130	0.326
Annoying	0.145	0.237	**0.302**	**0.020**
Eventful	0.104	0.400	**-0.325**	**0.012**
Vibrant	**0.411**	**0.028**	-0.099	0.457
Assessment of the sound environment	**-0.267**	**0.028**	**-0.361**	**0.005**
Appropriateness of the sound environment	-0.94	0.445	**-0.273**	**0.036**
Assessment of the visual environment	-0.077	0.535	**-0.341**	**0.008**
Appropriateness of visual environment	**-0.305**	**0.011**	-0.130	0.326
Overall Quality of Audio-Visual Environment	**-0.241**	**0.048**	**-0.363**	**0.005**

When examining the assessment of the surrounding sound environment relationships, several significant affective and visual correlations were observed. Table 12 summarizes the significant correlations between assessment of the surrounding sound environment and other perceptual variables in both settings. In the University Health Center, significant positive correlations were found with calm ($rs = 0.272$, $p = 0.023$), appropriateness of the sound environment ($rs = 0.392$, $p < 0.001$), assessment of the visual environment ($rs = 0.348$, $p = 0.003$), and appropriateness of the visual

environment (rs = 0.277, p = 0.020). Negative correlations were observed with annoying (rs = –0.385, p < 0.001) and chaotic (rs = –0.297, p = 0.012). These results suggest that participants who evaluated the sound environment more positively also tended to find the space calmer and visually appropriate, while negative affective impressions such as annoyance and chaos were linked to poorer sound evaluations.

In the Hospital Polyclinic, significant positive correlations were observed between the assessment of the sound environment and the attributes calm (rs = 0.560, p < 0.001), pleasant (rs = 0.464, p < 0.001), assessment of the visual environment (rs = 0.513, p < 0.001), appropriateness of the visual environment (rs = 0.424, p < 0.001), and appropriateness of the sound environment (rs = 0.475, p < 0.001). Significant negative correlations were found with annoying (rs = –0.560, p < 0.001), chaotic (rs = –0.544, p < 0.001), monotonous (rs = –0.335, p = 0.006), and human sounds (rs = –0.319, p = 0.008). It indicates that lower soundscape quality was associated with a higher presence of human sounds and negative affective soundscape attributes.

Table 12. Significant Spearman's Rho correlations between the assessment of the surrounding sound environment and measured variables

Items	The Health Center		The Hospital Polyclinic	
	rs	P value	rs	P value
Human sounds	-0.136	0.263	**-0.319**	**0.008**
Pleasant	0.197	0.101	**0.464**	**<0.001**
Calm	**0.272**	**0.023**	**0.560**	**<0.001**
Monotonous	-0.49	0.690	**-0.335**	**0.006**
Annoying	**-0.385**	**<0.001**	**-0.560**	**<0.001**
Chaotic	**-0.297**	**0.012**	**-0.544**	**<0.001**
Appropriateness of sound environment	**0.392**	**<0.001**	**0.475**	**<0.001**
Assessment of the visual environment	**0.348**	**0.003**	**0.513**	**<0.001**
Appropriateness of visual environment	**0.277**	**0.020**	**0.424**	**<0.001**

Table 13 presents the significant correlations between overall audio-visual quality and various auditory and visual perceptual attributes. In both settings, overall quality evaluation was positively associated with calm attribute, assessment of the sound and visual environments, and appropriateness of the sound environment, while negative associations were observed with negative soundscape descriptors like annoying and chaotic.

In the University Health Center, significant positive correlations were found between overall audio-visual quality and calm ($r_s = 0.388$, $p < 0.001$), assessment of the sound environment ($r_s = 0.470$, $p < 0.001$), appropriateness of the sound environment ($r_s = 0.375$, $p = 0.001$), and assessment of the visual environment ($r_s = 0.592$, $p < 0.001$). On the other hand, significant negative correlations were observed with annoying ($r_s = –0.489$, $p < 0.001$) and chaotic ($r_s = –0.410$, $p < 0.001$ Meaning that participants who rated the audio-visual environment more favorably also perceived the space as calmer, less annoying, and less chaotic.

In the Hospital Polyclinic, audio-visual quality showed a higher number of significant positive correlations. These included calm ($r_s = 0.433$, $p < 0.001$), pleasant ($r_s = 0.346$, $p = 0.004$), eventful ($r_s = 0.261$, $p = 0.033$), assessment of the sound environment ($r_s = 0.573$, $p < 0.001$), appropriateness of the sound environment ($r_s = 0.326$, $p = 0.007$), assessment of the visual environment ($r_s = 0.753$, $p < 0.001$), and appropriateness of the visual environment ($r_s = 0.598$, $p < 0.001$). Significant negative correlations were observed with technological sounds ($r_s = –0.273$, $p = 0.025$), natural sounds ($r_s = –0.294$, $p = 0.016$), uneventful ($r_s = –0.253$, $p = 0.039$), monotonous ($r_s = –0.380$, $p = 0.001$), annoying ($r_s = –0.401$, $p < 0.001$), and chaotic ($r_s = –0.366$, $p = 0.002$). These results indicate that higher ratings of audio-visual quality in the Hospital Polyclinic were associated with lower perceived presence of technological and natural sounds, and with lower ratings of negative affective attributes such as uneventful, monotonous, annoying, and chaotic.

Table 13. Significant Spearman's Rho correlations between the overall quality of the audio-visual environment and measured variables

Items	The Health Center		The Hospital Polyclinic	
	rs	P value	rs	P value
Frequency of visiting	0.093	0.442	**0.251**	**0.044**
Technological sounds	-0.154	0.203	**-0.273**	**0.025**
Natural sounds	0.102	0.406	**-0.294**	**0.016**
Pleasant	0.188	0.120	**0.346**	**0.004**
Calm	**0.388**	**<0.001**	**0.433**	**<0.001**
Uneventful	0.186	0.123	**-0.253**	**0.039**
Monotonous	-0.067	0.580	**-0.380**	**0.001**
Annoying	**-0.489**	**<0.001**	**-0.401**	**<0.001**
Chaotic	**-0.410**	**<0.001**	**-0.366**	**0.002**
Eventful	0.107	0.380	**0.261**	**0.033**
Assessment of the sound environment	**0.470**	**<0.001**	**0.573**	**<0.001**
Appropriateness of sound environment	**0.375**	**0.001**	**0.326**	**0.007**
Assessment of the visual environment	**0.592**	**<0.001**	**0.753**	**<0.001**
Appropriateness of visual environment	0.198	0.101	**0.598**	**<0.001**

4.2. Equivalent Continuous A-Weighted Sound Level (LAeq) Results

The mean Equivalent Continuous A-Weighted Sound Level (μLAeq) was 53.6 dB in the Bilkent University Health Center and 64.8 dB in the Bilkent City Hospital Oncology Polyclinic during the measurement periods. The difference was consistent with observational findings, as the health center generally had fewer occupants and lower activity levels.

CHAPTER V

DISCUSSION

This chapter discusses the findings based on the characteristics of the two healthcare settings and the roles of different user groups. The results are also evaluated with reference to existing literature. The discussion follows the same structure as the results and focuses on the main components of the study.

5.1. Sound Source Identification

Across both healthcare settings, human-based sounds were identified as the most dominant sound source, followed by technological sounds. Natural sounds and other noises were consistently rated as the least noticeable elements of the sound environment. These results were expected due to the social nature of these settings, where conversations, footsteps, and administrative activities are constantly present. These indicate that, regardless of the scale and complexity of the healthcare facility, human sounds remain the primary element shaping the acoustic environment. This outcome aligns with previous studies in similar healthcare contexts. Uğurlu (2022) reported human-based sounds as the most dominant source in outpatient waiting areas. Similarly, Dalirnaghadeh & Yılmazer (2022), through virtual acoustic

simulations, demonstrated that human sounds were consistently perceived as the most dominant auditory element in hospital environments. Alimadhi & Yılmazer (2025) further confirmed this result in both real-world hospital settings and laboratory-based experiments.

In the University Health Center, technological sounds were rated significantly higher by healthcare staff compared to patients. This may be attributed to the staff's continuous exposure to equipment noises such as computers, ventilation systems, and medical devices during their daily work routines. It likely makes them more sensitive to these sound sources. Patients, on the other hand, are likely to perceive these sounds as less noticeable during short visits. This aligns with Mackrill et al. (2013), who noted that staff often perceive and react to mechanical and technological sounds differently than patients, because these sounds are integrated into their daily tasks. This is further supported by Lam et al. (2022), who reported that staff experience higher levels of annoyance from mechanical and equipment-related sounds, such as HVAC noise or alarms, compared to patients and visitors.

5.2. Perceived Affective Quality (PAQ)

The PAQ results revealed a clear perceptual difference between the two healthcare settings. The University Health Center was rated significantly higher for calm, uneventful, and vibrant. In contrast, the Hospital Polyclinic was perceived as annoying and chaotic. It was hypothesized that the soundscape in the Bilkent University Health Center would be evaluated more positively than in the Bilkent City Hospital Oncology Polyclinic. This hypothesis was supported by the results, as the Health Center received higher ratings on positive PAQ. The differences could be attributed to the difference in spatial scale and environmental complexity. The University Health Center is a smaller and less crowded facility. In contrast, with its larger size and higher user density, Hospital Polyclinic has a more complex patient flow. Patients and their relatives frequently move between doctors' rooms and the reception desk, often talking with reception staff due to administrative issues. Therefore, this circulation pattern may likely contribute to the perception of a chaotic soundscape.

This aligns with Mackrill et al. (2014), who emphasize that hospital soundscape perception is influenced not only by noise levels but also by the types and patterns of sounds associated with ongoing activities. Similarly, Uğurlu (2022) found that the waiting area of a polyclinic was rated as more annoying compared to other sections, such as the courtyard or corridors. Alimadhi & Yılmazer (2025) also observed that hospital waiting areas are described as eventful, chaotic, and annoying, with lower mean values for calm and pleasantness. These studies suggest that indoor hospital soundscapes often carry more negative affective attributes.

In addition to the differences between the two healthcare settings, the PAQ results also revealed differences among user groups in the University Health Center. Hypothesis 2 proposed that healthcare staff would perceive the soundscape more negatively than patients and patients' relatives in both settings, was not supported regarding PAQ scores. Patients rated the environment as significantly calmer compared to healthcare staff, while healthcare staff perceived the environment as more vibrant than patients and their relatives. This difference could be associated with the routine and familiarity of daily operations in the Health Center. The smaller scale of the facility may foster closer interactions and a stronger sense of community among staff. It may enhance their perception of the environment as vibrant. The results align with Lam et al. (2022), who reported that hospital staff rated the vibrant and eventful attribute significantly higher than patients and visitors. In the Hospital Polyclinic, no statistically significant differences were observed among user groups. This could be due to the overall higher noise levels and the complex circulation patterns. It may dominate the acoustic experience and homogenize the perceptions across all user types.

The PAQ adjectives used in this study, specified in the ISO/TS 12913-2, were adapted into the Turkish context by Yılmazer et al. (2023), ensuring cultural and linguistic alignment. While most adjectives directly correspond to the terms used in the study, some required contextual adjustments to better fit the healthcare environment. The vibrant adjective was translated as "eğlenceli" (enjoyable) by Yılmazer et al. (2023). However, in the hospital context, especially within an oncology polyclinic, "eğlenceli" can be considered inappropriate. The study also highlights "canlı" (vivid) as one of the frequently preferred alternatives, which is

used in this study. This choice made the adjectives more appropriate for the hospital setting.

5.3. Assessment and Appropriateness of the Sound and Visual Environment

Participants in both settings evaluated not only how they perceived the sound and visual environment but also whether they found it appropriate for a healthcare context. The University Health Center received significantly higher ratings in both the sound environment assessment and its perceived appropriateness compared to the Hospital Polyclinic. This difference may be related to the smaller scale of the Health Center and its relatively quieter, more organized layout.

The results are consistent with previous research. For instance, Lam et al. (2022) found that users in tertiary-care hospitals were more likely to rate the acoustic environment as inappropriate when exposed to high noise levels and vocal disturbances. They also reported that staff members perceived the acoustic environment as less appropriate compared to patients. However, in the present study, user group differences were limited. Consistent with this, regarding Hypothesis 2, the results for assessment and appropriateness measures did not support it. In the University Health Center, no statistically significant differences were found among patients, relatives, and healthcare staff in their ratings of the sound and visual environment, or their appropriateness. In the Hospital Polyclinic, a significant difference was observed only for the appropriateness of the sound environment, with patients' relatives rating it lower than staff. These results suggest that the characteristics of the settings may lead to similar perceptions of assessments across different user groups.

5.4. Relationships Between Perceptual Variables

In both settings, the University Health Center and the Hospital Polyclinic, a longer duration of stay was associated with more negative perceptions of the environment. In the University Health Center, participants who stayed longer were more likely to notice technological and human sounds and described the environment as more vibrant. This may suggest that spending more time in the space may increase awareness of surrounding sounds. However, longer stays were also linked to lower ratings of calmness, uneventfulness, and lower evaluations of both the sound and

visual environment. These results may indicate that while the space may feel more vibrant over time, it may also become less comfortable or relaxing.

In the Hospital Polyclinic, a similar pattern was observed. Longer stays were associated with lower scores on pleasant, eventful, and overall audio-visual quality, while the annoying attribute showed a positive correlation with time spent. This may imply that extended exposure in this setting intensified negative emotional responses to sound. In both settings, participants who visited less frequently tended to stay longer. This may reflect a lack of familiarity with procedures or the physical environment. It may lead to an increased sensitivity to environmental stimuli.

Perceptions of the sound environment were closely linked to both soundscape attributes and visual impressions. In the Health Center, positive assessments of the soundscape were associated with calm and higher ratings of the appropriateness visual environment. Annoying and chaotic were strongly correlated with lower evaluations of the sound environment. Similarly, in the Hospital Polyclinic, participants who described the sound environment as calm and pleasant also rated the visual environment more positively. However, annoying, chaotic, and monotonous perceptions were associated with poorer sound evaluations. The presence of human sounds in this setting was also linked to lower sound environment scores. It may suggest that these sounds were perceived as overwhelming or disruptive in this more crowded and complex space.

The overall audio-visual quality, in both settings, showed that positive attributes like calm, pleasant, and eventful were associated with better ratings. Negative descriptors such as annoying and chaotic consistently corresponded to lower evaluations. In the Hospital Polyclinic, additional negative correlations were found with specific sound sources, such as technological and natural sounds. These findings may indicate that perceived quality in healthcare environments is not only shaped by the presence or absence of sounds but also by how these sounds are interpreted, the exposure time, and the context in which they are experienced.

CHAPTER VI

CONCLUSION

Most studies on hospital soundscapes have primarily emphasized objective acoustic parameters, with relatively limited attention to comparisons between different healthcare settings. Few studies have examined how different user groups, such as patients, patients' relatives, and healthcare staff, perceive the auditory environments. Addressing this gap, this study compared soundscape perceptions in waiting areas of two outpatient healthcare settings, the Bilkent University Health Center and the Bilkent City Hospital Oncology Polyclinic. The selected settings have different scales and environmental complexities. The research employed ISO/TS 12913-2 Method A for subjective evaluations and measurements of sound level (LAeq) for the objective. Responses were collected from 138 participants in total, including patients, patients' relatives, and healthcare staff, through a field survey using a convenience sampling method. User groups were evaluated within settings.

The findings showed that human sounds were identified as the primary sound source in both settings and by all user groups. These findings align with previous studies, which reported that human-based sounds dominate the acoustic environment. The analysis of PAQ results revealed that there is a perceptual difference between the two

settings. While the University Health Center was perceived as significantly calmer, uneventful, and vibrant, the Hospital Polyclinic was more chaotic. Among user groups in the Health Center, patients perceived the environment as calmer compared to healthcare staff, while staff rated it as more vibrant. In contrast, no significant differences among user groups were observed in the Hospital Polyclinic. These perceptual differences can be linked to environmental characteristics such as spatial scale, human density, user flow, and activity levels.

The assessment of the sound and visual environment demonstrated that the University Health Center was evaluated as more appropriate compared to the Hospital Polyclinic. Although visual evaluations did not show significant differences between the two settings, the audio-visual quality was rated higher by patients in the Health Center. Correlation analysis revealed that longer stays in both settings' waiting areas were associated with negative soundscape perceptions. This may suggest that extended waiting periods tend to reduce positive acoustic impressions, particularly in larger and busier environments.

6.1. Outcomes for Designers

The results of this study emphasize the importance of creating healthcare waiting areas with improved acoustic quality. In large-scale facilities such as the Hospital Polyclinic, the dominance of human sounds and higher background noise levels were associated with negative perceptions such as annoyance and chaos. To address these issues, design strategies should focus on improving speech privacy and reducing background noise. This can be achieved by using sound-absorbing materials, such as acoustic wall panels or ceiling elements. Clear circulation patterns, as observed in the University Health Center, can also contribute to a calmer acoustic environment. Larger facilities can be designed as smaller units to achieve a more manageable environment. Both waiting areas lacked daylight and visual connections to nature. Designing healthcare spaces with windows or biophilic visual elements can enhance overall environmental quality. In the oncology polyclinic, many consultation rooms do not have any window openings, unlike the Health Center. For healthcare staff, providing rooms with access to daylight or nature views can positively influence their perception of the sound environment.

6.2. Limitations

This study has several limitations that should be acknowledged. First, the sample size in both healthcare settings was relatively small. It may have reduced statistical power and increased the risk of Type II errors. For instance, while some measures showed significant results in the Kruskal-Wallis test, no significant differences were observed in the post-hoc pairwise comparisons. This discrepancy could be attributed to the limited sample size. Second, the reliability analysis yielded unexpected results, with a lower Cronbach's alpha value for the University Health Center dataset. Participants in this setting were expected to provide more consistent responses due to higher education levels. However, the results showed the opposite. This may indicate that factors such as user expectations or familiarity with the environment may have influenced response consistency. Third, demographic differences, particularly age differences between participants in the two healthcare settings and user groups, might have influenced the perceptual evaluations. Controlling for this factor with covariance analysis could enhance the accuracy of statistical results. Furthermore, the results are context dependent. Conducting the study in a different polyclinic might have yielded different perceptual outcomes, as soundscape evaluations are strongly shaped by spatial, social, and functional characteristics of the environment.

6.3. Future Research

This study employed subjective evaluations with objective acoustic measurements to analyze healthcare soundscapes. However, the objective measurements were limited to sound levels (LAeq), which alone are not sufficient to fully represent the acoustic environment. Future research could incorporate additional objective parameters, such as psychoacoustic metrics. This would help build stronger correlations with subjective evaluations. Moreover, future research could use advanced analytical methods to examine the relationship between subjective evaluations and objective acoustic parameters. Using larger sample sizes for perceptual measurement could also allow for more reliable results for user perceptions. Another promising direction is to explore the potential restorative design interventions by examining how positive soundscapes enhance user comfort in healthcare environments. Finally, the findings should be used as a guide to translate research into practice for healthcare design at different scales and settings.

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APPENDICES

APPENDIX A

Bilkent Üniversitesi

Sayı : E-19220902-600.605-67033
Konu : 633 no.lu Etik Onay Başvurusu

08/03/2025

Sayın Dr. Öğretim Üyesi Semiha YILMAZER

Danışmanı olduğunuz, Bilkent Üniversitesi Ekonomi ve Sosyal Bilimler Enstitüsü, İç Mimarlık ve Çevre Tasarımı Ana Sanat Dalı yüksek lisans programı öğrencisi Oya Yıldız ile 633 no.lu "Assessing Soundscape Perceptions of Patients and Healthcare Staff in a University Health Center." adlı çalışma kapsamında yapmayı önerdiğiniz etkinlik için yaptığınız başvuru Bilkent Üniversitesi, İnsan Araştırmaları Etik Kurulu'nun 04/03/2025 tarih ve İAEK_2025_03_04_01 sayılı toplantısında görüşülmüş olup etkinliğin genel bilim etiği açısından uygun olduğuna karar verilmiştir.

Bu karar, yapmayı önerdiğiniz çalışmanın genel bilim etiği açısından bir değerlendirmesi olup, çalışmanızda, kurulumuzun değerlendirmesi dışında kalabilen özel etik ve yasal sınırlamalara uymakla ayrıca yükümlü olduğunuzu bildiririz.

Kurul kararı ekte sunulmaktadır.

Bilgilerinizi rica ederim.

Prof. Dr. Halil Altay GÜVENİR
Bilkent Üniversitesi İnsan Araştırmaları Etik Kurul Başkanı

Ek: Karar

Bu belge, güvenli elektronik imza ile imzalanmıştır.
Evrak doğrulama https://ebys-dogrulama.bilkent.edu.tr/ adresinden d665b326 kodu ile yapılabilir.

Bilkent Üniversitesi, 06800 Bilkent Ankara
Tel: (0 312)290 40 00 Faks: (0 312)266 41 27 www.bilkent.edu.tr
ebys@bilkent.edu.tr - bilkentuni@hs01.kep.tr

Bilgi için: Birgül BULUT
Yönetici Sekreter
Telefon No: 0 312 29012 14

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Bilkent Üniversitesi

AKADEMİK İŞLER REKTÖR YARDIMCILIĞI

İNSAN ARAŞTIRMALARI ETİK KURULU KARARLARI

Toplantı Tarihi : 04/03/2025
Toplantı No : İAEK_2025_03_04_01
Saat : 17:00

Üyeler: Prof. Dr. Halil Altay Güvenir (Başkan), Bilgisayar Mühendisliği
Doç. Dr. Işık Yuluğ, Moleküler Biyoloji ve Genetik
Dr. Öğr. Üyesi Burcu Ayşen Ürgen, Psikoloji
Dr. Öğr. Üyesi Şemsi Barış Özçelik, Hukuk
Uzman Öğretim Görevlisi Dr. Emine Öncüler Yayalar, Siyaset Bilimi ve Kamu Yönetimi
Prof. Dr. Özgür Ulusoy (Yedek Üye), Bilgisayar Mühendisliği
Dr. Öğr. Üyesi Pınar Altınok Ormancı (Yedek Üye), Hukuk

Gündem: 633 no.lu "Assessing Soundscape ..." adlı çalışma için etik kurul onay başvurusu.

Karar: Üniversitemiz Güzel Sanatlar, Tasarım ve Mimarlık Fakültesi Dr. Öğretim Üyesi Semiha Yılmazer danışmanlığında, Ekonomi ve Sosyal Bilimler Enstitüsü, İç Mimarlık ve Çevre Tasarımı Ana Sanat Dalı yüksek lisans programı öğrencisi Oya Yıldız'ın 633 no.lu "Assessing Soundscape Perceptions of Patients and Healthcare Staff in a University Health Center." adlı çalışma kapsamında yapmayı önerdikleri etkinliğin genel bilim etiği açısından uygun olduğuna, uygunluk verilen çalışma önerisinin karar ekinde yer alan çalışma önerisi, çalışma yürütücüleri ve bilgilendirme formu için geçerli olduğuna, toplantıya katılan üyelerin oy birliği ile karar verildi.

Prof. Dr. Halil Altay GÜVENİR Başkan Katıldı	Doç. Dr. Işık YULUĞ Üye Toplantıya Katılmadı	Dr. Öğr. Üyesi Burcu Ayşen ÜRGEN Üye Katıldı
Dr. Öğr. Üyesi Şemsi Barış ÖZÇELİK Üye Katıldı	Dr. Emine ÖNCÜLER YAYALAR Üye Katıldı	Prof. Dr. Özgür ULUSOY Yedek Üye Katıldı

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Tel: (0 312)290 40 00 Faks: (0 312)266 41 27 www.bilkent.edu.tr
ebys@bilkent.edu.tr - bilkentuni@hs01.kep.tr

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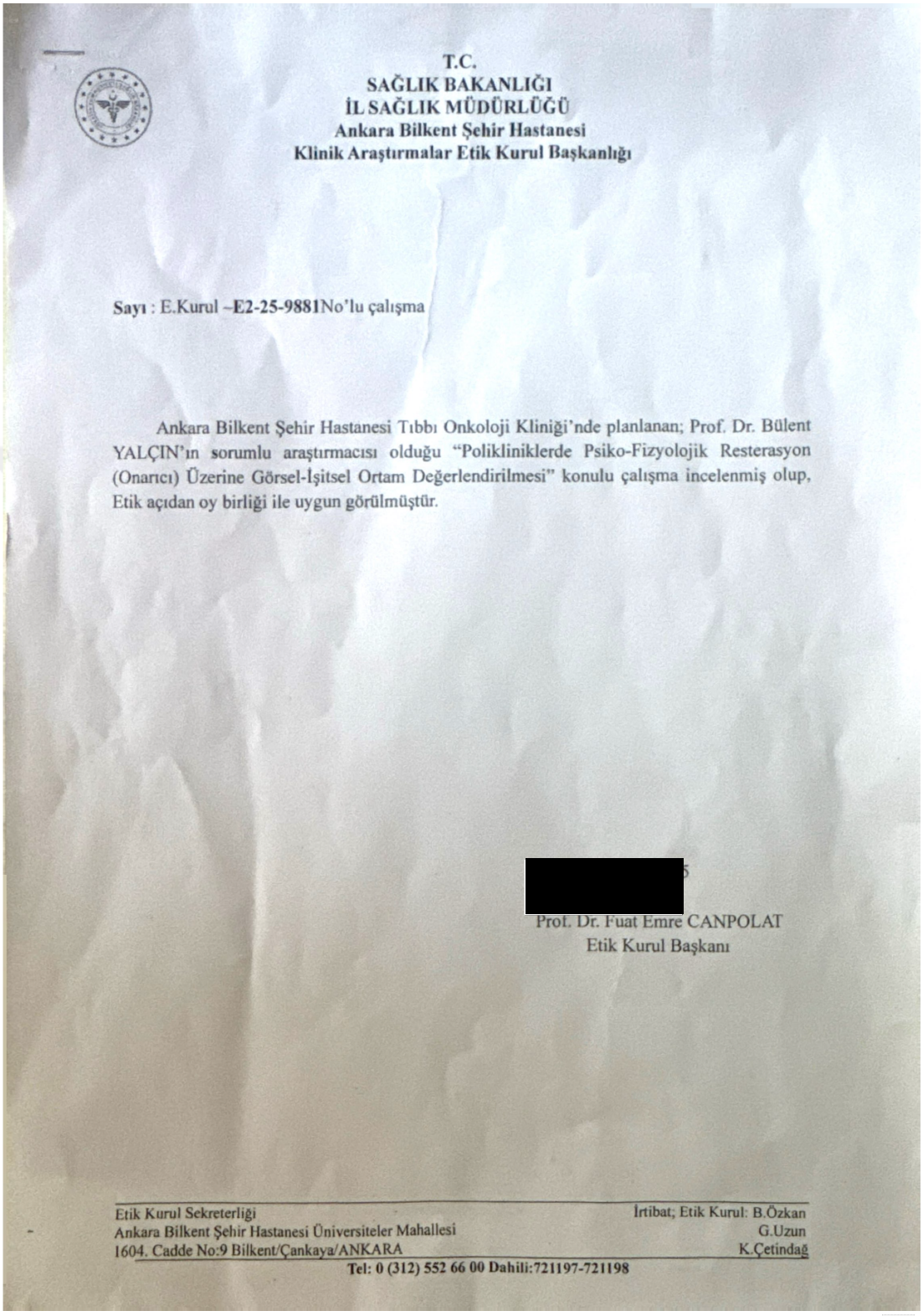
APPENDIX B



T.C.
SAĞLIK BAKANLIĞI
İL SAĞLIK MÜDÜRLÜĞÜ
Ankara Bilkent Şehir Hastanesi
Klinik Araştırmalar Etik Kurul Başkanlığı

Sayı : E.Kurul –**E2-25-9881**No'lu çalışma

Ankara Bilkent Şehir Hastanesi Tıbbı Onkoloji Kliniği'nde planlanan; Prof. Dr. Bülent YALÇIN'ın sorumlu araştırmacısı olduğu "Polikliniklerde Psiko-Fizyolojik Resterasyon (Onarıcı) Üzerine Görsel-İşitsel Ortam Değerlendirilmesi" konulu çalışma incelenmiş olup, Etik açıdan oy birliği ile uygun görülmüştür.

[redacted]
Prof. Dr. Fuat Emre CANPOLAT
Etik Kurul Başkanı

Etik Kurul Sekreterliği
Ankara Bilkent Şehir Hastanesi Üniversiteler Mahallesi
1604. Cadde No:9 Bilkent/Çankaya/ANKARA
Tel: 0 (312) 552 66 00 Dahili:721197-721198

İrtibat; Etik Kurul: B.Özkan
G.Uzun
K.Çetindağ

KLİNİK ARAŞTIRMALAR ETİK KURULU KARAR FORMU

ARAŞTIRMANIN AÇIK ADI	Polikliniklerde Psiko-Fizyolojik Resterasyon (Onarıcı) Üzerine Görsel-İşitsel Ortam Değerlendirilmesi
VARSA ARAŞTIRMANIN PROTOKOL KODU	-

ETİK KURUL BİLGİLERİ	ETİK KURULUN ADI	**Ankara Bilkent Şehir Hastanesi Klinik Araştırmalar Etik Kurul**
	AÇIK ADRESİ:	Üniversiteler Mah. Bilkent Cad. No:1 ÇANKAYA /ANKARA
	TELEFON	0312 552 66 00
	FAKS	ankarash.etikkurul2@sağlıkgov.tr

BAŞVURU BİLGİLERİ	KOORDİNATÖR/SORUMLU ARAŞTIRMACI UNVANI/ADI/SOYADI	Prof. Dr. Bülent YALÇIN			
	KOORDİNATÖR/SORUMLU ARAŞTIRMACININ UZMANLIK ALANI	Tıbbı Onkoloji Kliniği			
	KOORDİNATÖR/SORUMLU ARAŞTIRMACININ BULUNDUĞU MERKEZ	**Ankara Bilkent Şehir Hastanesi**			
	VARSA İDARİ SORUMLU UNVANI/ADI/SOYADI	-			
	DESTEKLEYİCİ	-			
	PROJE YÜRÜTÜCÜSÜ UNVANI/ADI/SOYADI (TÜBİTAK vb. gibi kaynaklardan destek alanlar için)	-			
	DESTEKLEYİCİNİN YASAL TEMSİLCİSİ	-			
	ARAŞTIRMANIN FAZI VE TÜRÜ	FAZ 1	☐		
		FAZ 2	☐		
		FAZ 3	☐		
		FAZ 4	☐		
		Gözlemsel ilaç çalışması	☐		
		Tıbbi cihaz klinik araştırması	☐		
		İn vitro tıbbi tanı cihazları ile yapılan performans değerlendirme çalışmaları	☐		
		İlaç dışı klinik araştırma	☐		
		Diğer ise belirtiniz: **Prospektif Çalışma** (Enkela ALIMADHI'nın tezi)			
	ARAŞTIRMAYA KATILAN MERKEZLER	TEK MERKEZ ☒	ÇOK MERKEZLİ ☐	ULUSAL ☒	ULUSLARARASI ☐

Etik Kurul Başkanının
Unvanı/Adı/Soyadı:Prof. Dr. Fuat Emre CANPOLAT
İmza: [redacted]

KLİNİK ARAŞTIRMALAR ETİK KURULU KARAR FORMU

ARAŞTIRMANIN AÇIK ADI	Polikliniklerde Psiko-Fizyolojik Resterasyon (Onarıcı) Üzerine Görsel-İşitsel Ortam Değerlendirilmesi
VARSA ARAŞTIRMANIN PROTOKOL KODU	-

	Belge Adı	Tarihi	Versiyon Numarası	Dili
DEĞERLENDİRİLEN BELGELER	ARAŞTIRMA PROTOKOLÜ			Türkçe ☐ İngilizce ☐ Diğer ☐
	BİLGİLENDİRİLMİŞ GÖNÜLLÜ OLUR FORMU			Türkçe ☐ İngilizce ☐ Diğer ☐
	OLGU RAPOR FORMU			Türkçe ☐ İngilizce ☐ Diğer ☐
	ARAŞTIRMA BROŞÜRÜ			Türkçe ☐ İngilizce ☐ Diğer ☐

	Belge Adı		Açıklama
DEĞERLENDİRİLEN DİĞER BELGELER	SİGORTA	☐	
	ARAŞTIRMA BÜTÇESİ	☐	
	BİYOLOJİK MATERYEL TRANSFER FORMU	☐	
	İLAN	☐	
	YILLIK BİLDİRİM	☐	
	SONUÇ RAPORU	☐	
	GÜVENLİLİK BİLDİRİMLERİ	☐	
	DİĞER:	☐	

KARAR BİLGİLERİ	**Karar No:E2-25-9881**	**Tarih: 22/01/2025**
	Yukarıda bilgileri verilen başvuru dosyası ile ilgili belgeler araştırmanın/çalışmanın gerekçe, amaç, yaklaşım ve yöntemleri dikkate alınarak incelenmiş ve uygun bulunmuş olup araştırmanın/çalışmanın başvuru dosyasında belirtilen merkezlerde gerçekleştirilmesinde etik ve bilimsel sakınca bulunmadığına toplantıya katılan etik kurul üye tam sayısının salt çoğunluğu ile karar verilmiştir. Beşeri Tıbbi Ürünlerin Klinik Araştırmaları Hakkında Yönetmelik kapsamında yer alan araştırmalar/çalışmalar için Türkiye İlaç ve Tıbbi Cihaz Kurumu'ndan izin alınması gerekmektedir.	

Etik Kurul Başkanının
Unvanı/Adı/Soyadı:Prof. Dr. Fuat Emre CANPOLAT
İmza [redacted]

9881

KLİNİK ARAŞTIRMALAR ETİK KURULU KARAR FORMU

ARAŞTIRMANIN AÇIK ADI	Polikliniklerde Psiko-Fizyolojik Resterasyon (Onarıcı) Üzerine Görsel-İşitsel Ortam Değerlendirilmesi
VARSA ARAŞTIRMANIN PROTOKOL KODU	-

KLİNİK ARAŞTIRMALAR ETİK KURULU	
ETİK KURULUN ÇALIŞMA ESASI	Beşeri Tıbbi Ürünlerin Klinik Araştırmaları Hakkında Yönetmelik, İyi Klinik Uygulamaları Kılavuzu
BAŞKANIN UNVANI / ADI / SOYADI:	Prof. Dr. Fuat Emre CANPOLAT

Unvanı/Adı/Soyadı	Uzmanlık Alanı	Kurumu	Cinsiyet		Araştırma ile ilişki		Katılım *		İmza
Prof. Dr. Fuat Emre CANPOLAT	Çocuk Sağlığı ve Hastalıkları Neonatoloji	Ankara Bilkent Şehir Hastanesi	E ☒	K ☐	E ☐	H ☒	E ☒	H ☐	[redacted]
Prof. Dr. Dilek ŞAHİN	Kadın Hastalıkları ve Doğum /Perinatoloji	Ankara Bilkent Şehir Hastanesi	E ☐	K ☒	E ☐	H ☐	E ☐	H ☐	
Prof. Dr. Hayriye Gözde KANMAZ KUTMAN	Çocuk Sağlığı ve Hastalıkları Neonatoloji	Ankara Bilkent Şehir Hastanesi	E ☐	K ☒	E ☐	H ☒	E ☐	H ☐	
Prof. Dr. Bedia DİNÇ	Tıbbi Mikrobiyoloji	Ankara Bilkent Şehir Hastanesi (S.B.Ü)	E ☐	K ☒	E ☐	H ☒	E ☒	H ☐	
Prof. Dr. Mehmet Ali Nahit ŞENDUR	Tıbbi Onkoloji	Ankara Bilkent Şehir Hastanesi (YBÜ)	E ☒	K ☐	E ☐	H ☒	E ☒	H ☐	
Prof. Dr. Gülhan KURTOĞLU ÇELİK	Acil Tıp	Ankara Bilkent Şehir Hastanesi (YBÜ)	E ☐	K ☒	E ☐	H ☐	E ☐	H ☐	
Prof. Dr. Dilek ÖZTAŞ	Halk Sağlığı	Ankara Bilkent Şehir Hastanesi (YBÜ)	E ☐	K ☒	E ☐	H ☐	E ☐	H ☐	
Prof. Dr. Yasemin Özderin ÖZİN	Gastroenteroloji	Ankara Bilkent Şehir Hastanesi	E ☐	K ☒	E ☐	H ☐	E ☐	H ☐	
Doç. Dr. Ayça Tuba DUMANLI ÖZCAN	Anestezi ve Reanimasyon	Ankara Bilkent Şehir Hastanesi	E ☐	K ☒	E ☐	H ☒	E ☒	H ☐	
Doç. Dr. Muhammet Kadri ÇOLAKOĞLU	Gastroenteroloji Cerrahisi	Ankara Bilkent Şehir Hastanesi	E ☒	K ☐	E ☐	H ☐	E ☐	H ☒	
Doç. Dr. Gökhan UÇAR	Tıbbi Onkoloji	Ankara Bilkent Şehir Hastanesi	E ☒	K ☐	E ☐	H ☒	E ☒	H ☐	
Uzm. Dr. Zehra Aydın BEK	Tıbbı Farmakoloji	Ankara Bilkent Şehir Hastanesi	E ☐	K ☒	E ☐	H ☒	E ☒	H ☐	
Sağ. Mens. Olm. Üye. Mehmet Hilmi ŞEÇİLMİŞ	İktisat Maliye	Emekli	E ☒	K ☐	E ☐	H ☒	E ☐	H ☐	
Av. Mesut KELEKÇİBAŞI	Hukuk	Serbest Avukat	E ☒	K ☐	E ☐	H ☒	E ☒	H ☐	
Mühendis Erhan BAYSAL	Biyomedikal Mühendis	Ankara Bilkent Şehir Hastanesi	E ☒	K ☐	E ☐	H ☒	E ☒	H ☐	

*:Toplantıda Bulunma

Etik Kurul Başkanının
Unvanı/Adı/Soyadı:Prof. Dr. Fuat Emre CANPOLAT
İmza: [redacted]

APPENDIX C

Anket Formu- Sağlık Ortamlarında Ses Manzarası Algısı Araştırması

Bu anket, Bilkent Üniversitesi İç Mimarlık ve Çevre Tasarımı Bölümü'nde hazırlanan algılanan ses ortamı algısının araştırması kapsamında gerçekleştirilmektedir. Çalışma sağlık merkezlerindeki ses manzarası algılarını incelemeyi amaçlamaktadır. Bulunduğunuz bekleme alanındaki deneyiminizle ilgili kısa bir anket doldurmanız istenecektir. Katılım tamamen gönüllülük esasına dayalıdır ve herhangi bir sebeple katılımınızı istediğiniz zaman sonlandırabilirsiniz. Tüm yanıtlarınız gizli tutulacak ve yalnızca bilimsel amaçlarla kullanılacaktır. Daha fazla bilgi için: [redacted]

Tarih: Saat: Hava Durumu:

A. Kişisel Bilgiler

1. **Kaç yaşındasınız?** …….

2. **Cinsiyetiniz nedir?**
   ☐ Kadın ☐ Erkek ☐ Diğer

3. **İşitmede hiç zorluk çekiyor musunuz?**
   ☐ Evet ☐ Hayır

4. **Size daha önce hiç işitme kaybı teşhisi konuldu mu?**
   ☐ Evet ☐ Hayır

5. **Hastanede bulunma amacınız nedir?**
   ☐ Hasta ☐ Hasta yakını ☐ Sağlık çalışanı

6. **Burayı ne sıklıkla ziyaret ediyorsunuz?**
   ☐ Günlük ☐ Aylık
   ☐ Haftalık ☐ Yıllık

7. **Burada ne kadar süre vakit geçiriyorsunuz?** ….

B. Anket Bölümü

B1. Ses kaynağı tanımlama

Şu anda dinlediğiniz dört çeşit sesi hangi ölçüde değerlendirirsiniz? Lütfen her ses çeşidi için bir yanıt seçin.					
	Hiç	**Biraz**	**Kısmen**	**Çok fazla**	**Tamamen hâkim**
Teknolojik cihaz sesleri (Bilgisayar, klima, havalandırma, vb.)	☐	☐	☐	☐	☐
Diğer sesler (Siren, inşaat, endüstriyel, vb.)	☐	☐	☐	☐	☐
İnsan sesleri (Diyalog, kahkaha, ayak sesleri, vb.)	☐	☐	☐	☐	☐
Doğa sesleri (Kuş sesleri, rüzgâr, yağmur, vb.)	☐	☐	☐	☐	☐

B2. Algılama etkin nitelik

Aşağıdaki her 8 ölçek için, dinlediğiniz ortam sesinin tanımlanmasına ne ölçüde katılırsınız ya da katılmazsınız? Lütfen her tanım için bir yanıt seçin.					
	Kesinlikle katılıyorum	**Katılıyorum**	**Ne katılıyorum ne katılmıyorum**	**Katılmıyorum**	**Kesinlikle katılmıyorum**
• **Rahatlatıcı**	☐	☐	☐	☐	☐
• **Kargaşalı**	☐	☐	☐	☐	☐
• **Canlı**	☐	☐	☐	☐	☐
• **Sıkıcı**	☐	☐	☐	☐	☐
• **Sakin**	☐	☐	☐	☐	☐
• **Rahatsız**	☐	☐	☐	☐	☐
• **Dinamik**	☐	☐	☐	☐	☐
• **Tekdüze**	☐	☐	☐	☐	☐

B3. Çevredeki ses ortamının değerlendirilmesi

Dinlediğiniz çevredeki ses ortamını genel olarak nasıl tanımlarsınız?

☐ Çok iyi ☐ İyi ☐ Ne iyi ne kötü ☐ Kötü ☐ Çok kötü

B4. Çevredeki ses ortamının uygunluğu

Genelinde, dinlediğiniz var olan ses ortamı bulunduğunuz mekâna ne ölçüde uygun?

☐ Hiç değil ☐ Çok az ☐ Kısmen ☐ Çok fazla ☐ Mükemmel

B5. Çevredeki görsel ortamın değerlendirilmesi

Gördüğünüz çevredeki görsel ortamı genel olarak nasıl tanımlarsınız?

☐ Çok iyi ☐ İyi ☐ Ne iyi ne kötü ☐ Kötü ☐ Çok kötü

B6. Çevredeki görsel ortamın uygunluğu

Genelinde, gördüğünüz var olan görsel ortam bulunduğunuz mekâna ne ölçüde uygun?

☐ Hiç değil ☐ Çok az ☐ Kısmen ☐ Çok fazla ☐ Mükemmel

B7. Görsel-işitsel ortamın değerlendirilmesi

Gördüğünüz çevredeki ortamı genel olarak nasıl tanımlarsınız?

☐ Çok iyi ☐ İyi ☐ Ne iyi ne kötü ☐ Kötü ☐ Çok kötü

APPENDIX D

Questionnaire Survey- Research on Soundscape Perception in Healthcare Settings

This survey is conducted within the scope of the perceived sound and visual environment research prepared at Bilkent University, Department of Interior Architecture and Environmental Design. The study explores perceptions of soundscapes in healthcare settings. You will be asked to complete a short questionnaire about your experience in the waiting area. Participation is entirely voluntary, and you may withdraw at any time without any consequences. All responses will remain anonymous and confidential and will only be used for scientific purposes. For more information: [redacted]

Date: Hour: Weather Condition:

☐ Waiting Area ☐ Pre-examination Room ☐ Doctor's Room

A. Personal Information

1. **Age** …….
2. **Gender**
   ☐ Female ☐ Male ☐ Other
3. **Do you have any difficulty with hearing?**
   ☐ Yes ☐ No
4. **Have you ever been diagnosed with hearing loss?**
   ☐ Yes ☐ No
5. **What is your purpose of being in the health center?**
   ☐ Patient ☐ Patient's relative ☐ Healthcare Staff
6. **How often do you visit the health center?**
   ☐ Daily ☐ Monthly
   ☐ Weekly ☐ Annually
7. **How long do you stay at the health center?** ……

B. Questionnaire Part

B1. Sound Source Identification

To what extend do you presently hear the following four types of sounds? Please tick off one response alternative per type of sound					
	Not at all	**A Little**	**Moderately**	**A lot**	**Dominates completely**
Noise from technological devices (eg.computer,HVAC,typing)	☐	☐	☐	☐	☐
Other noise (eg.sirens,construction,industry)	☐	☐	☐	☐	☐
Sounds from human beings (eg. Conversation,laughter,footsteps)	☐	☐	☐	☐	☐
Natural Sounds (eg.singing birds,wind,rain)	☐	☐	☐	☐	☐

B2. Perceived Affective Quality

For each of the 8 scales below,to what extend do you agree or disagree that present surrounding sound environment is… Please tick off one response alternative per scale					
	Strongly agree	**Agree**	**Neither agree, nor disagree**	**Disagree**	**Strongly disagree**
• **Pleasant**	☐	☐	☐	☐	☐
• **Chaotic**	☐	☐	☐	☐	☐
• **Vibrant**	☐	☐	☐	☐	☐
• **Uneventful**	☐	☐	☐	☐	☐
• **Calm**	☐	☐	☐	☐	☐
• **Annoying**	☐	☐	☐	☐	☐
• **Eventful**	☐	☐	☐	☐	☐
• **Monotonous**	☐	☐	☐	☐	☐

B3. Assessment of the surrounding sound environment

Overall, how would you describe the present surrounding sound environment?

☐ Very good ☐ Good ☐ Neither good, nor bad ☐ Bad ☐ Very bad

B4. Appropriateness of the surrounding sound environment

Overall, to what extent is the present surrounding sound environment appropriate the present place?

☐ Not at all ☐ Slightly ☐ Moderately ☐ Very ☐ Perfectly

B5. Assessment of the surrounding visual environment

Overall, how would you describe the present surrounding visual environment?

☐ Very good ☐ Good ☐ Neither good, nor bad ☐ Bad ☐ Very bad

B6. Appropriateness of the surrounding visual

Overall, to what extent is the present surrounding visual environment appropriate to the present place?

☐ Not at all ☐ Slightly ☐ Moderately ☐ Very ☐ Perfectly

B7. Assessment of the surrounding audio-visual environment

Overall, how would you describe the present surrounding environment?

☐ Very good ☐ Good ☐ Neither good, nor bad ☐ Bad ☐ Very bad