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Designing Therapeutic Waiting Areas: A New Media Framework for Reducing Stress in Healthcare Environments

Raja Eda Shabina Raja Raimie[1], *Mohammad Kamal Sabran[2], *Nur Zaidi Azraai[3]
[1,2,3]*Department of New Media Design & Technology, School of The Arts, Universiti Sains Malaysia, Pulau Pinang, Malaysia*

[1]shabyazhar@gmail.com/rajaedashabina@student.usm.my, [2]kamalsabran@usm.my, [3]nurzaidi@usm.my*
***Corresponding Author**

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ABSTRACT

Long waiting times in healthcare settings are correlated with increased patient anxiety and dissatisfaction. Prolonged wait time averaging is 40 minutes in primary care clinics. Despite improvements in healthcare design, the necessary furnishings to provide a relaxing and healing environment are still lacking in many waiting areas. This issue is addressed gap in this study through an exploration of the potential of interactive media, guided by Lev Manovich's principles of new media, to transform waiting areas into spaces of relaxation and to enhance well-being and contribute to Sustainable Development Goal 3 (Good Health and Well-being). A novel framework is developed for the designing of interactive media installations that incorporate visual nature, natural sounds, and interactivity to enhance patient experiences and promote well-being by applying Lev Manovich's new media principles of modularity, variability, automation, and transcoding to interactive media installations. A triangulated qualitative methodology is employed, wherein contextual relevance is explored through semi-structured interviews with healthcare professionals (n=3), professional experts in new media (n=5), and patients (n=30), supplemented by document analysis of existing waiting area designs. The findings emphasize the importance of integrating natural elements and interactivity into media designs to create personalized, engaging patient experiences. The transformative potential of interactive media is highlighted in reducing stress, improving patient satisfaction, and fostering therapeutic environments aligning with SDG 3's objective of ensuring healthy lives and promoting well-being for all ages. Manovich's principles are extended into healthcare design, bridging theory and practice, and a roadmap is offered for implementing innovative media designs in healthcare facilities. It is recommended that future research empirically test the framework, evaluate its long-term impacts, and explore scalability across diverse healthcare settings.

Keywords: *Waiting Areas, Lev Manovich, Interactive Media, Nature-Inspired Visual, Reducing Stress*

1 INTRODUCTION

Waiting times in healthcare environments remain a persistent concern globally, often contributing to increased patient anxiety, frustration, and overall dissatisfaction with the healthcare experience (Thompson et al., 1996). In Malaysia, this issue is particularly pronounced in public healthcare, where patients often experience extended waiting periods due to high patient loads and limited resources. On average, patients in primary care settings face waiting periods of approximately 40 minutes from registration to seeing a doctor (Azraii et al., 2017) during which the physical environment can either exacerbate stress or serve as a therapeutic buffer. While architectural advancements have improved

healthcare infrastructure, many waiting areas still lack the essential elements necessary to create environments conducive to healing and psychological comfort (Andrade & Devlin, 2015; R. S. Ulrich et al., 2008). There is growing recognition of the need to rethink waiting areas not as passive transitional zones but as active components of the patient journey that can influence emotional states, health outcomes, and satisfaction and promote psychological well-being and mental health (World Health Organization Regional Office for Western Pacific Region, 2025). This aligns with the goals of Sustainable Development Goal 3 (SDG 3): to ensure healthy lives and promote well-being for all ages (United Nations in Malaysia, 2025).

This study addresses that gap by exploring how interactive media installations, guided by Lev Manovich's foundational principles of new media, which are modularity, variability, automation, and transcoding (Lev Manovich, 2001, 2020) can be designed to transform conventional waiting areas in the healthcare environment into immersive, restorative spaces. Drawing on the Biophilic Design Theory (BDT), Attention Restoration Theory (ART), and Stress Reduction Theory (SRT), this research develops a novel framework that incorporates elements such as visual nature, ambient soundscapes, and patient interactivity. These components aim to foster positive affective states, reduce stress, and improve the overall waiting experience (Kaplan, 1993).

The objective of this study is to develop a novel framework for designing therapeutic waiting areas that enhance patient experiences and promote well-being by integrating visual nature, natural sounds, and interactivity, using Lev Manovich's new media principles—modularity, variability, automation, and transcoding as a guide. This development not only enhances the patient experience but also contributes to Sustainable Development Goal 3, which aims to ensure healthy lives and promote well-being for all ages.

This study uses a triangulated qualitative approach that includes semi-structured interviews with healthcare professionals *(n=3)*, professionals in new media *(n=5)*, and patients *(n=30)*, as well as an analysis of the existing designs for waiting areas. Findings from the study show the importance of integrating naturalistic and interactive features into waiting areas in the healthcare environment, reinforcing the role of environmental design in supporting psychological well-being. Interactive media installations not only provide a means of distraction or entertainment but also serve as therapeutic interventions that can align with broader healthcare goals, including stress reduction and increased patient satisfaction. Future research is recommended to empirically evaluate the developed framework across diverse healthcare contexts and assess its long-term psychological and operational impacts.

2 LITERATURE REVIEW

In recent years, the integration of media art has become more important in healthcare settings, especially when it comes to transforming waiting areas into spaces that encourage calm and psychological well-being. Media art in this context includes interactive installations, augmented reality, virtual reality, and sensory-based experiences, all of which engage users in immersive and interactive ways. Several studies have explored the integration of interactive media installations to enhance patient well-being and mental health.

Waiting areas are crucial in influencing patients' perceptions of the quality and experience of healthcare. The length of wait times and the sterile environment of poorly designed waiting areas often exacerbate anxiety and stress (Arneill & Devlin, 2002). To address these challenges, integrating interactive media and nature-inspired visuals in waiting areas has emerged as a potential solution to enhance patient well-being and reduce stress. A recent study by Raja Eda Shabina et al., (2024) explored the use of immersive nature-inspired interventions in institutional healthcare environments in Malaysia. The findings revealed that such interventions could significantly reduce stress levels among patients, thereby enhancing their overall well-being by integrating art and technology to support mental well-being in institutional healthcare settings.

Furthermore, exposure to natural elements, such as visual art depicting nature, has been shown to reduce stress levels and anxiety in patients. According to Nanda (2010) the studies on the impact of visual art in emergency departments found that art depicting nature could positively influence patient behaviour and reduce anxiety, thereby potentially improving the waiting experience. Similarly, previous studies have highlighted the importance of incorporating biophilic and patient-centred design elements in healthcare environments. These findings reinforce the notion that interactive media art can serve as an effective tool for cognitive recovery and facilitating flow states, creating positive distractions that help redirect patients' attention away from anxiety-inducing aspects of the healthcare experience (Raja Eda Shabina; et al., 2024).

The design of waiting areas is especially important in paediatric settings since children are more sensitive to unfamiliar situations. Research by Qi et al., (2021) examined the use of space and behavioural activities in paediatric clinic waiting areas, highlighting the importance of designing environments that address the specific needs of young patients to improve overall satisfaction. A systematic review conducted by Xia Yingqiao; et al., (2024) at Universiti Putra Malaysia examined the impact of art installations on patient satisfaction in paediatric waiting areas. The review found that the incorporation of digital artwork and interactive media in paediatric waiting areas contributed to calmer environments, reduced perceived wait times, and enhanced the overall waiting experience. Technology innovation continues to shape how media art is applied in healthcare. In the "ScreenPlay" project developed by Biddiss et al., (2013) demonstrate the successful implementation of interactive media displays in hospital waiting areas. This initiative showed that such installations could provide positive, engaging experiences without the need for physical contact, thereby reducing the risk of infection transmission a critical consideration in healthcare settings.

While these studies emphasize the value of nature-inspired visuals, the integration of interactive media art takes this concept further by offering personalized and immersive experiences. Here, the principles of new media introduced by (Lev Manovich, 2001, 2020) provide a useful theoretical lens to understand how digital technologies can enhance patient well-being. These principles are *modularity, variability, automation,* and *transcoding* are offer insights into how media art installations can be designed to respond to patients' needs in dynamic and engaging ways. By applying these concepts, healthcare facilities can create adaptive, responsive environments that promote relaxation and psychological comfort.

Manovich's principle of *modularity* involves organizing media into distinct components such as sound, image, and text that can be independently modified or combined. In healthcare waiting rooms, this modularity enables the integration of various sensory elements, including visual representations of nature, ambient sounds, and interactive games, tailored to meet diverse user needs. The principle of *variability* allows these systems to dynamically adjust based on user input or context, facilitating personalized experiences for a broad patient demographic. *Automation* permits system-driven adaptations, such as calming visuals that change according to the time of day or user activity. *Transcoding* refers to the transformation of content across cultural and computer layers, exemplified by applications that blend digital aesthetics with therapeutic objectives. Collectively, these principles support a design approach that is adaptive, user-centred, and emotionally responsive qualities that are particularly beneficial in healthcare environments.

In combination, the literature emphasizes how interactive media, guided by Manovich's new media principles and supported by Biophilic Design Theory (BDT) (Kellert et al., 2008), Attention Restoration Theory (ART) (Kaplan & Kaplan, 1989) , and Stress Reduction Theory (SRT) (R. Ulrich, 2023) , present a unique opportunity to enhance patient experiences, satisfaction, therapeutic environments and well-being. These theoretical and empirical findings taken together provide a good foundation for developing innovative, and scalable interventions in hospital waiting areas in line with Sustainable Development Goal 3 (Good Health and Well-being).

This research aims to bridge these gaps by proposing a framework tailored to the Malaysian healthcare context, offering both theoretical insights and practical applications. Below is the conceptual

framework for the study titled Designing Therapeutic Waiting Areas: A New Media Framework for Reducing Stress in Healthcare Environments. The framework is divided into four main components:

1. Theoretical Foundation: Lev Manovich's principles of new media.
2. Theories: Biophilic Design Theory, Attention Restoration Theory, Stress Reduction Theory
3. Interactive Media Design Elements: Visual Nature, Natural Soundscapes, Interactivity.
4. Outcomes: Stress Reduction, Enhanced Patient Experience, and Therapeutic Environment.

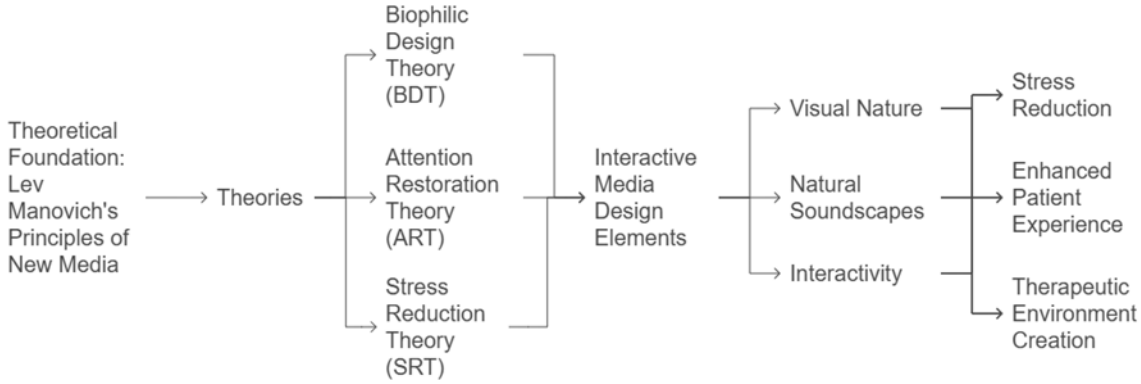

Figure 1 Conceptual Framework

The conceptual framework for designing therapeutic waiting areas in healthcare settings is grounded by Lev Manovich's Principles of New Media, which provide the theoretical foundation for this research. Manovich's principles are *modularity, variability, automation, and transcoding* that offer insights into creating dynamic, adaptable, and user-centred media experiences (Lev Manovich, 2001, 2020). These concepts guide the design of interactive media art that responds to users' needs, making them particularly suitable for therapeutic environments.

Building upon this foundation, the framework integrates three key theories to inform the development of interactive media design elements: Biophilic Design Theory (BDT), Attention Restoration Theory (ART), and Stress Reduction Theory (SRT). These theories provide evidence-based insights into how natural elements and media interactions can enhance psychological well-being.

Visual Nature, supported by Biophilic Design Theory (Kellert et al., 2008), leverages the innate human connection to nature to foster calming and restorative visual experiences. Through visual representations of natural landscapes, simulations, or imagery, healthcare environments can mitigate stress and promote relaxation.

Natural Soundscapes, as supported by recent findings (Zhu et al., 2024), further enhance the sensory experience by engaging the auditory senses. Sounds such as water streams, bird songs, and rustling leaves are effective in reducing anxiety and contributing to psychological restoration.

Interactivity, in alignment with Manovich's (Lev Manovich, 2001) emphasis on user participation, empowers patients to engage actively with the media. This user-centred approach offers personalization options, allowing individuals to select preferred visuals, adjust soundscapes, or navigate interactive environments. This sense of control and agency has been shown to reduce stress and enhance overall patient experience.

Together, these design elements work synergistically to achieve three primary outcomes: stress reduction, enhanced patient experience, and the creation of a therapeutic waiting environment. The integration of these theories and design principles ensures that therapeutic waiting areas are not only aesthetically pleasing but also contribute to emotional well-being and psychological recovery. This conceptual framework establishes a cohesive relationship between the theoretical foundation, the interactive media design elements, and the intended outcomes, providing a robust structure for evaluating the effectiveness of therapeutic media interventions in healthcare waiting areas.

3 METHODOLOGY

3.1 Research Design

This study adopts a qualitative research design to explore the potential of interactive media, guided by Lev Manovich's principles of new media, to transform waiting areas into spaces of relaxation to enhance well-being and contribute to Sustainable Development Goal 3 (Good Health and Well-being). The population for this study includes healthcare professionals, designers, and patients who frequently use healthcare facilities in Malaysia. A purposive sampling technique is employed to select participants who have relevant knowledge or experience with healthcare design, interactive media, or therapeutic environments. The sample size consists of healthcare professionals *(n=3),* professional experts in new media *(n=5),* and patients *(n=30),* supplemented by document analysis of existing waiting area designs, ensuring a balanced perspective from both creators and users of waiting areas (Palinkas et al., 2015).

3.2 Data Collection

Data collection involves semi-structured interviews and document analysis. The semi-structured interviews are designed to gather in-depth insights into participants' experiences, perceptions, and recommendations regarding the integration of interactive media, visual nature, and natural soundscapes in healthcare waiting areas (Kallio et al., 2016). The interview protocol includes open-ended questions aligned with the study's objectives, to develop a novel framework for designing therapeutic waiting areas guided by Lev Manovich's new media principles and the therapeutic potential of such media. Additionally, relevant documents, such as hospital design guidelines and examples of implemented interactive media in healthcare settings, are analysed to complement the interview data and provide contextual understanding.

3.3 Data Analysis

Data collected from interviews and documents are analysed using thematic analysis, following Braun & Clarke, (2006) six-phase framework. This method ensures a systematic approach to identifying, analysing, and reporting patterns (themes) within the data. The analysis focuses on uncovering themes related to the application of Lev Manovich's principles, and the design elements of interactive media. NVivo software is used to manage and code the qualitative data, ensuring efficient organization and retrieval of themes.

4 ANALYSIS & RESULT

A thematic analysis approach (Braun & Clarke, 2021) was used to analyse both semi-structured interviews and document analysis data. NVivo 12 software supported coding, allowing for pattern identification across the 30 participant interviews and institutional documents. Five key themes emerged:

1. Perceived Therapeutic Value of Visual Nature-Inspired
2. Interactive Engagement and Sense of Control
3. Personal Connection and Emotional
4. Multisensory Integration and Immersive Design
5. Institutional Intent Versus Implementation Gaps

Theme 1: Perceived Therapeutic Value of Visual Nature-Inspired

Across interviews, participants described visual nature and natural soundscapes as powerful tools in reducing stress and inducing calm. Many shared experiences of walking into a waiting area with interactive media art projections of landscapes and ambient sounds that made them "feel like they could breathe again." One participant shared:

"When I walked in and saw the nature projection video with those soft wave sounds coming from the lake and birds singing, I instantly felt less tense. It made me feel like I could breathe." – Participant 6

This reflects Stress Reduction Theory (SRT) (R. Ulrich, 2023), which suggests that exposure to natural stimuli, even in digital form, lowers physiological arousal and anxiety. Recent studies (Zhu et al., 2024) support this, showing that digital nature in healthcare lobbies significantly reduces patient anxiety and enhances emotional well-being.

Another participant described how a forest scene reminded them of hiking back home, which made them feel grounded and distracted them from the medical tests ahead:

"The moving forest scene with the sunlight filtering through the trees reminded me of hiking back home. It grounded me and took my mind off the medical tests I was waiting for." – Participant 2

In addition, healthcare staff recognized that patients exposed to the calming nature integrated with interactive media were more cooperative and emotionally settled during consultations. Professionals also valued the non-pharmacological aspect of stress management, viewing it as a low-risk, scalable intervention.

"The waiting experience creates the emotional tone for the rest of the visit. If patients are calmer, it helps the whole clinical interaction." If patients are calmer, it helps the whole clinical interaction." – Nurse

This emotional connection aligns with Biophilic Design Theory (BDT) (Kellert et al., 2008), Attention Restoration Theory (ART) (Kaplan & Kaplan, 1989), where natural elements foster familiarity, comfort, and gentle engagement often described as "soft fascination." Together, these experiences demonstrate how immersive, visual nature-based can create emotionally supportive environments that reduce stress, promote psychological restoration, and enhance the overall patient experience.

Theme 2: Interactive Engagement and Sense of Control

Participants consistently highlighted the value of interactivity, particularly the ability to select or control the nature-based content projection in the waiting area. This was not only engaging but psychologically empowering:

"Just choosing something myself, even a small thing like picking the scene, gave me a sense of control while waiting." – Participant 3

"Being able to choose what I want to see or hear made me feel more in control, which helped ease my stress." – Participant 7

Theme 3: Personal Connection and Emotional

Several participants emphasized that visual nature-inspired was most effective when it felt personally meaningful or reflected familiar environments. While all participants generally appreciated nature elements, many expressed stronger emotional responses to scenes that resonated with their background or identity:

"The tropical forest was calming and reminded me of home with its soothing water sounds."– Participant 5

"The pokok hujan-hujan and birds sound made me feel peaceful—it reminded me of Tasik Taiping." – Participant 12

In addition to insights from patients and healthcare professionals, the expert new media design emphasized the importance of personalization and emotional responsiveness in designing therapeutic environments. These experts confirmed a growing shift toward interactive environments that integrate biophilic content with user-centred technologies, aiming not only to engage but to restore and support emotional well-being.

"When we design immersive media, the goal isn't just visual appeal—it's emotional modulation. That's where nature and interactivity are incredibly powerful." – New Media Designer

"Personalization is key. Patients need to feel that the environment 'sees' them. That's when interactivity becomes meaningful, not gimmicky." – New Media Designer

These insights reinforce the idea that interactive media becomes most effective when it offers meaningful, individualized experiences. The opportunity to choose natural settings or calming audiovisual elements fosters a stronger emotional connection between the patient and the environment. This aligned with Lev Manovich's principles of user participation and variability in new media, where modular digital content enables personalized and adaptive experiences.

Experts also stressed the importance of designing flexible, immersive systems that can respond to varying emotional needs across different patient populations. They advocated for interdisciplinary collaboration between media designers, clinicians, and spatial planners to ensure that therapeutic interactivity is implemented purposefully enhancing emotional regulation and reducing stress in a measurable and scalable way.

Theme 4: Multisensory Integration and Immersive Design

Participants repeatedly emphasized the immersive effect of combining visual and sound natural elements. This multisensory experience heightened the feeling of *"being somewhere else,"* helping patients detach from stressful clinical contexts.

"The visuals alone were nice, but when the sound came on—birds chirping and wind—it felt real. That's when I really relaxed." – Participant 14

This theme supports SRT and ART, which both emphasize the healing benefits of sensory-rich, restorative environments. According to theory, exposure to natural environments has a stronger impact on emotional regulation than visual exposure alone. Participants' experiences validate this by describing how layered sensory inputs helped them mentally "step outside" the medical context and experience calm.

Theme 5: Institutional Intent Versus Implementation Gaps

While institutional documents reviewed often referenced "healing environments" and "biophilic design," they rarely included concrete strategies for implementing interactive, sensory-rich digital experiences in waiting areas. Most focused on architectural materials (e.g., wood, plants, light) but overlooked digital media as a therapeutic tool.

This reflects findings from Devlin & Arneill, (2003), who note a disconnect between evidence-based design (EBD) literature and practical implementation. The lack of explicit media guidelines indicates the need for greater interdisciplinary collaboration between healthcare designers, media specialists, and clinicians.

Figure 2 Prototyping Testing (Source: Author's personal collection, 2023)

5 CONCLUSION

This study explored the role of interactive, nature-inspired in the design of therapeutic healthcare waiting areas, using a conceptual framework guided by Lev Manovich's Principles of New Media, Biophilic Design Theory (BDT), Attention Restoration Theory (ART), and Stress Reduction Theory (SRT).

Participants consistently described positive emotional and physiological responses to immersive nature-based environments. Interactive landscapes, calming ambient sounds, and familiar, personally meaningful scenes evoked feelings of calm, emotional connection, psychological comfort from the healthcare environment supporting both Stress Reduction Theory (SRT) and Biophilic Design Theory (BDT). These findings affirm that simulated exposure to nature can offer therapeutic benefits comparable to those of real natural environments, particularly in urban or institutional settings where direct access to nature is limited.

A core insight of this study was the value of interactivity in patient engagement. Participants reported that having the ability to select and personalize media content gave them a sense of agency and control during a typically passive and stressful experience. This aligns with Manovich's (2001, 2020) emphasis on user participation and modularity in digital media, and with Attention Restoration Theory (ART), which underlines the importance of voluntary attention and soft fascination in restorative environments.

From a practical perspective, the study highlights the need for interdisciplinary collaboration in healthcare design. While biophilic architecture is increasingly embraced, the integration of interactive media as a therapeutic tool remains underutilized. Design guidelines should move beyond aesthetic considerations to include specific recommendations for multisensory digital installations, customization, and user-centred technologies that empower patients within clinical settings.

6 SUGGESTION FOR FUTURE RESEARCH

Future research should focus on empirically testing the proposed framework in diverse healthcare settings, evaluating its effectiveness in reducing patient stress and improving satisfaction. Longitudinal studies are needed to assess the long-term impacts of interactive media installations and their scalability across different healthcare facilities. Additionally, future research could explore the maintenance and cost-effectiveness of these installations, providing insights into their practical implementation. Expanding the study to include other cultural contexts beyond Malaysia would also enhance its applicability and relevance. Finally, the integration of emerging technologies, such as AI-driven personalization and augmented reality, could be explored to further innovate the design of interactive media in healthcare settings.

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AUTHOR CONTRIBUTIONS

All authors played equal contributions towards the production of this paper.

CONFLICT OF INTEREST

The author declares no potential conflict of interest with respect to the research, authorship, and/or publication of this article.

REFERENCES

Andrade, C. C., & Devlin, A. S. (2015). Stress reduction in the hospital room: Applying Ulrich's theory of supportive design. *Journal of Environmental Psychology*, *41*, 125–134. https://doi.org/10.1016/j.jenvp.2014.12.001

Arneill, A. B., & Devlin, A. S. (2002). Perceived quality of care: The influence of the waiting room environment. *Journal of Environmental Psychology*, *22*(4), 345–360. https://doi.org/10.1006/jevp.2002.0274

Azraii, A. B., Kamaruddin, K. N., & Ariffin, F. (2017). An assessment of patient waiting and consultation time in a primary healthcare clinic. *Malaysian Family Physician*, *12*(1), 14–21. http://e-mfp.org/wp-content/uploads/2017/04/original-article-2.pdf

Biddiss, E., McPherson, A., Shea, G., & McKeever, P. (2013). The Design and Testing of Interactive Hospital Spaces to Meet the Needs of Waiting Children. *Health Environments Research and Design Journal*, *6*(3), 49–68. https://doi.org/10.1177/193758671300600305

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Devlin, A. S., & Arneill, A. B. (2003). Health care environments and patient outcomes: A review of the literature. *Environment and Behavior*, *35*(5), 665–694. https://doi.org/10.1177/0013916503255102

Kallio, H., Pietilä, A. M., Johnson, M., & Kangasniemi, M. (2016). Systematic methodological review: developing a framework for a qualitative semi-structured interview guide. *Journal of Advanced Nursing*, *72*(12), 2954–2965. https://doi.org/10.1111/jan.13031

Kaplan, R. (1993). The role of nature in the context of the workplace. *Landscape and Urban Planning*, *26*(1–4), 193–201. https://doi.org/10.1016/0169-2046(93)90016-7

Kaplan, R., & Kaplan, S. (1989). The Experience of Nature: A Psychological Perspective. In *Cambridge*

University Press (Issue 1). Cambridge University Press.

Kellert, S. R., Heerwagen, J. H., & Mador, M. L. (2008). *Biophilic Design The Theory, Science and Practice of Bringing Buildings to Life*. John Wiley & SOns, Inc., Hoboken, New Jersey.

Lev Manovich. (2001). The Language of New Media. In *Book*.

Lev Manovich. (2020). Cultural Analytics. In *Cultural Analytics*. https://doi.org/10.7551/mitpress/11214.001.0001

Nanda, U. (2010). *Impact of Visual Art on Waiting Behavior in the Emergency Department*. 1–88.

Palinkas, L. A., M.Horwitz, S., Green, C. A., Wisdom, J. P., Duan, N., & Hoagwood, K. (2015). Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Adm Policy Ment Health*, 533–544. https://doi.org/10.1007/s10488-013-0528-y.

Qi, Y., Yan, Y., Lau, S. S., & Tao, Y. (2021). Evidence-Based Design for Waiting Space Environment of Pediatric Clinics—Three Hospitals in Shenzhen as Case Studies. *International Journal of Environmental Research and Public Health*, *18*(22). https://doi.org/10.3390/ijerph182211804

Raja Eda Shabina;, Mohammad Kamal Sabran;, & Azraai, N. Z. (2024). Art and Nature: Enhancing Well-Being and Cognitive Recovery Healthcare Environments Through Immersive Nature-Inspired Interventions in Malaysia. *INTERNATIONAL JOURNAL OF RESEARCH AND INNOVATION IN SOCIAL SCIENCE (IJRISS)*, *VIII*(IIIS), 5132–5513. https://doi.org/10.47772/IJRISS.2024.803382S

Raja Eda Shabina, Mohammad Kamal Sabran, & Nur Zaidi Azraai. (2024). Media Art in Healthcare Environments: Enhancing Student's Well-being and Mental Health. *International Journal of Art and Design*, *8*(1), 130–145. https://doi.org/10.24191/ijad.v8i1.1391

Thompson, D. A., Yarnold, P. R., Williams, D. R., & Adams, S. L. (1996). Effects of Actual Waiting Time, Perceived Waiting Time, Information Delivery, and Expressive Quality on Patient Satisfaction in the Emergency Department. *Annals of Emergency Medicine*, *28*(6), 657–665. https://doi.org/10.1016/S0196-0644(96)70090-2

Ulrich, R. (2023). *Ulrich, R.S. (2023) Stress reduction theory*. *January*, 143–146.

Ulrich, R. S., Zimring, C., Zhu, X., DuBose, J., Seo, H. B., Choi, Y. S., Quan, X., & Joseph, A. (2008). A review of the research literature on evidence-based healthcare design. *Herd*, *1*(3), 61–125. https://doi.org/10.1177/193758670800100306

United Nations in Malaysia, S. and B. D. (2025). *United Nations Malaysia, Singapore and Brunei Darussalam*. https://malaysia.un.org/en/sdgs

World Health Organization Regional Office for Western Pacific Region. (2025). *Health promotion*. World Health Organization. https://www.who.int/westernpacific

Xia Yingqiao;, Saifull Hasley Ramli;, & Zurina Zainudin. (2024). Enhancing Pediatric Patient Satisfaction through Art Installations in Waiting Areas: A Systematic Review. *International Journal of Academic Research in Progressive Education and Development*, *13*(3), 2584–2591. https://doi.org/10.6007/ijarped/v13-i3/21986

Zhu, R., Yuan, L., Pan, Y., Wang, Y., Xiu, D., & Liu, W. (2024). Effects of natural sound exposure on health recovery: A systematic review and meta-analysis. *Science of the Total Environment*, *921*(February), 171052. https://doi.org/10.1016/j.scitotenv.2024.171052