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DESIGNING FOR THE SENSES: MULTISENSORY APPROACHES IN THERAPEUTIC CLINICAL SPACES

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ABSTRACT

Spatial design significantly influences interactions with the built environment, engaging senses through visual, auditory, and tactile stimuli. However, in therapeutic clinical settings, the sensory experience is often overlooked in favor of aesthetic considerations, limiting the understanding of user responses to spatial cues. This study investigates the role and impact of multisensory design on user responses in therapeutic clinical environments. By analyzing design parameters such as lighting, acoustics, materials, and textures, the research aims to establish a framework for creating therapeutic clinical spaces that prioritize multisensory stimulation. Through case studies, interviews, and surveys, the study assesses user perceptions and psychological responses to different sensory stimuli in clinical settings. The findings indicate a preference for environments that engage multiple senses, with factors such as layout, color tones, forms, lighting, and finishes playing crucial roles in shaping user experiences. The proposed framework offers practical guidance for designers and architects, emphasizing the importance of sensory design in enhancing interactions between users and clinical environments, ultimately contributing to a more holistic and immersive therapeutic experience.

Keywords: Wellness, Sensory Stimulation, Multisensory, Human Perception, Clinical Design

1. INTRODUCTION

Humans interpret the world through various sensory cues, making them inherently multi sensory beings. Sensory design aims to enhance users' quality of life by creating environments that positively influence physiological, cognitive, emotional, behavioral, and spiritual well-being. Therapeutic design specifically focuses on fostering a healthy mind-body relationship within spaces. Mental health deterioration among professionals is a growing concern, with the World Health Organization reporting that 15% of the working-age population experiences mental health issues. The Cigna 360° Global Well-Being Survey 2022 highlights that employees in the UAE have particularly high stress levels, with 90.6% reporting stress complaints, indicating a critical need for environments that support mental wellness. This underscores the importance of integrating sensory design principles in workplaces and therapeutic settings.

Role of Built Environment in Human Psychology: As urbanization increases, with 68% of the global population projected to live in urban areas by 2050 (United Nations, 2018), the built environment's influence on human psychology becomes more significant. The physical and social aspects of these environments directly and indirectly affect behaviors and mental health. Factors like crowding, noise, lighting, and air quality can lead to psychological issues, such as stress from noise, depression from lack of sunlight, or behavioral problems from pollutants.

Multi sensory Experience in Built Environment: Humans interpret their surroundings using multiple senses, each with unique contributions to daily life (Krishnaprasad, 2020). The built environment provides sensory messages that shape perception, requiring a design approach that engages all senses. Multisensory experiences generate more complex neural activity, enhancing cognitive stimulation and intensifying sensations.

Multi sensory Experience & Human Perception: Multi sensory design (MSD) aims to enhance user sensory perception, integrating various sensory modalities into a cohesive experience. Neuroscience supports theories like perception-action dynamics and limited resource theories, which describe the interaction between perception, cognition, and environment, as well as cognitive limitations in attention and memory tasks.

Human Perception: Perception, a complex process involving interpretation and encoding, is foundational to MSD. Theories such as Gestalt, Embodied Cognition, and Affordance provide insights into human perception. Gestalt theory, crucial for designers, explains how the brain organizes sensory information into coherent wholes based on principles like similarity, continuity, proximity, symmetry, closure, and common fate. These principles help designers understand how different sensory inputs are perceived as a unified experience.

Figure 1

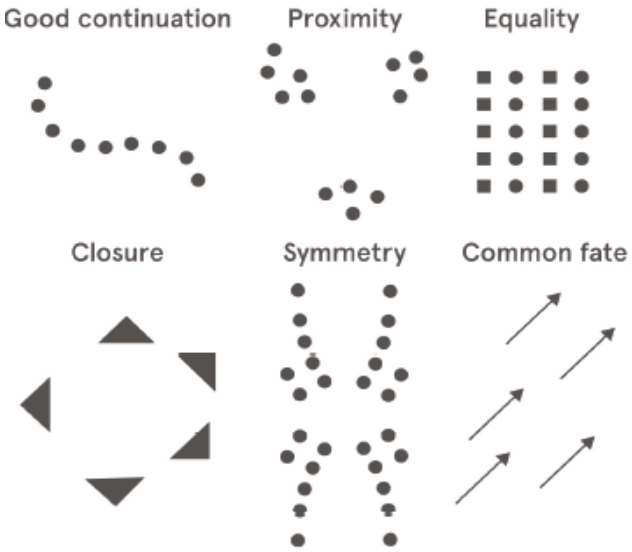

Figure 1 The Gestalt Factors (Ranne, 2019)

Embodied Cognition Theory*:* Embodied cognition theory posits that thoughts emerge from an action-perception loop, where perceptions drive actions and vice versa. This interaction involves integrating sensory inputs with prior knowledge to

interpret new information. For example, when encountering or thinking about a dog, sensory, emotional, and psychological experiences are automatically recalled, illustrating how the body, brain, and environment are interconnected. Humans rely on multisensory experiences for accurate perception, as no single sensory system can fully capture environmental nuances. Sensory data alone is insufficient; interpretation, often explained through Bayesian reasoning, combines prior knowledge with new sensory evidence. This dynamic process supports the concept of multisensory design, which, while not influencing prior knowledge, enhances user interaction with their surroundings.

Figure 2

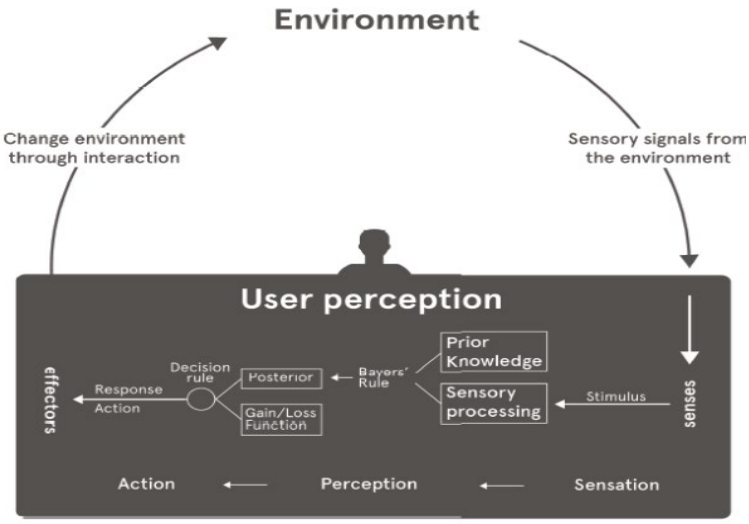

Figure 2 Ernst and Bulthoff's study served as the foundation for the action-perception loop in humans. (Ranne, 2019)

Affordance Theory : According to affordance theory, people form assumptions about how things function based on the informational cues provided by their environment, known as affordances. These affordances are objective properties that suggest possible actions, such as a chair's ability to support sitting or standing. However, they are unique to each individual's behavior and perception, making them challenging to measure in a physical sense. Affordances are not influenced by cultural background or prior knowledge and are classified into four types: perceptible (clearly indicated), hidden (not apparent), false (misleading information), and correct rejection (no affordance or consideration of it). Affordances subtly guide behavior without requiring advanced cognitive skills and remain constant despite changing user needs. Effective spaces quickly reveal various affordances and anti-affordances, sometimes using signifiers to highlight specific attributes. A person's experience of a space, influenced by sensory cues like touch, sound, and sight, can be positive, neutral, or negative based on their past experiences and current perceptions.

Figure 3

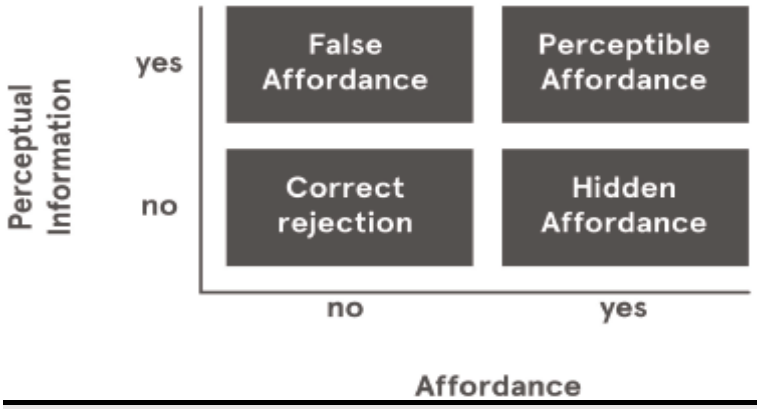

Figure 3 Different categories of affordances (Ranne, 2019)

Flow Experience Theory: Flow Experience Theory posits that users have optimal experiences when they engage in activities that are challenging yet align with their skill levels, resulting in a state of focus, enjoyment, and diminished self-awareness known as "flow." This experience can occur even in tasks initially perceived as frustrating if the challenge and skill balance is appropriate. Designing environments to facilitate flow can enhance user experiences, with multisensory design playing a key role in creating conditions conducive to flow. For example, workplaces and hospitality settings should be designed to support continuous engagement in tasks or leisure activities, allowing users to become fully immersed in the experience. During flow, individuals lose awareness of their difficulties and even their self-consciousness, enabling deeper focus and satisfaction.

Figure 4

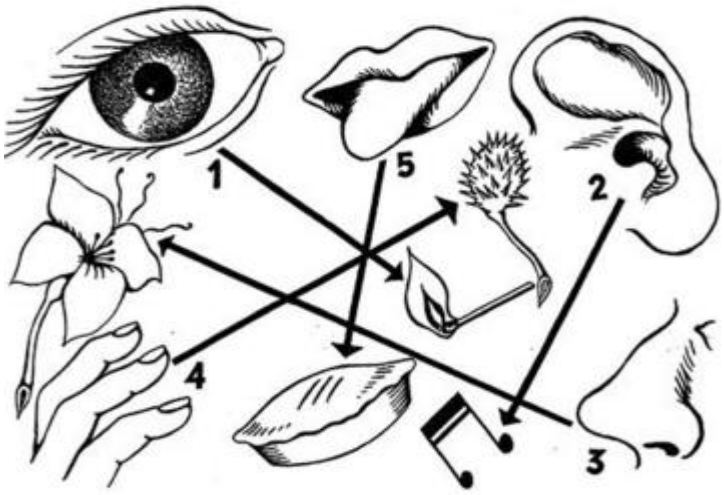

Figure 4 Ranking of various human senses. (Spence, 2020)

Importance Of Multisensory Design in Clinical Design: The integration of sensory design in healthcare environments has become a key aspect of contemporary design, emphasizing the holistic experience of users. This approach considers how individuals interact with spaces, both consciously and unconsciously, through various sensory cues. A well-designed space can significantly reduce stress and enhance the overall experience for patients, families, and caregivers by addressing visual, auditory, olfactory, and tactile senses. Visual elements like color,

patterns, and art, particularly nature-inspired artworks, can create a calming environment and aid in wayfinding. Acoustic design helps maintain privacy, reduce noise, and provide soothing sounds, while addressing the often harsh auditory landscape of medical settings. Olfactory considerations involve minimizing unpleasant smells that can evoke negative emotions, using materials with low VOCs, and enhancing air quality with ventilation and plants. Tactile aspects focus on the comfort and hygiene of materials, contributing to a sense of care and safety. This comprehensive sensory approach ensures that healthcare environments are supportive, comforting, and conducive to healing.

Design Elements In A Multisensory Clinical Design: Sensory design involves the careful orchestration of spatial sensations to enhance the quality of experience for users of a built environment. Therapeutic architecture extends this concept by creating spaces that are physically, cognitively, emotionally, behaviorally, and spiritually aligned with human needs. When effectively designed, therapeutic environments can stimulate the senses in a way that supports the body's regenerative and self-healing processes. Key components of a multimodal healthcare setting that contribute to well-being include color, shape, material, light, acoustics/sound, space circulation, air quality, and natural elements. These factors collectively create a holistic and supportive environment that promotes healing and well-being.

Table 1

Table 1 Analysis of the interrelation between Human senses & various parameters of design elements

	Color	Form							Material		Light		Acoustics	Space Circulation		IAQ	Natural element
		Shape	Height	Similarity	Proximity	Symmetry	Closure	Continuity	Texture	Pattern	Natural	Artificial		Way finding / Signages	Windows & Entrance doors		
Sight																	
Auditory																	
Touch																	
Smell																	

Multi sensory Design Tools in A Therapeutic Health Care: In 2020, 21% of adults in the United States experienced a mental illness, often treated with a combination of medication, psychotherapy, and alternative therapies. Music therapy uses the mood-enhancing properties of music to improve mental health, reduce anxiety, and enhance overall well-being by engaging brain areas related to memory and emotion. Aromatherapy involves inhaling essential oils, like tea tree, lavender, and peppermint, which can alleviate anxiety and depression by directly influencing the brain's emotional center. Sensory gardens provide therapeutic benefits by engaging the senses in a peaceful, natural environment, which can reduce stress, improve well-being, and increase productivity, demonstrating the value of holistic approaches in supporting psychological health.

Importance Of Mental Wellness Among Professionals: An increasing number of working professionals are experiencing mental health issues, such as depression, anxiety, loss of concentration, behavioral changes, and physical symptoms, largely due to work-related stress. Depression often manifests as fatigue, low morale, and absenteeism, leading to productivity loss. Anxiety can cause mood

disturbances, impatience, and physical ailments like headaches and stomach issues, which can significantly hinder daily functioning. Loss of concentration is common across various mental health disorders, reducing productivity and decision-making quality. Behavioral changes, such as withdrawal or irritability, often signal underlying mental health struggles. Additionally, physical symptoms like muscular pain are frequently associated with psychological issues and can be exacerbated by poor working conditions, highlighting the profound impact of workplace stress on both mental and physical health.

2. OBSERVATIONS, FINDINGS AND RESULTS

The research methodology of the study incorporates mixed methods including both qualitative and quantitative tools. Case studies and semi-structured interviews are included as qualitative tools. Surveys that are performed using a survey questionnaire are included as quantitative tools.

The semi-structured interview provided insights into the interviewee's perspective on the design of therapeutic wellness clinics, emphasizing their connection to the emotions and psychological well-being of users. The interviewee highlighted that these spaces cater to patients with various psychological conditions, necessitating a built environment that adapts to the patients' emotional states and therapeutic needs.

The interviewee stressed the importance of various design elements in creating a conducive environment in a multimodal therapeutic clinic. Key aspects discussed included:

- Furniture and Form: The interviewee noted that furniture layout plays a significant role in the overall form of the space. Thoughtfully arranged furniture can enhance the therapeutic environment, making it more welcoming and comfortable for patients.
- Color Schemes: The interviewee emphasized the psychological impact of colors in therapeutic settings. A balanced use of warm and cool tones can influence users' moods, suggesting a ratio of 70:30 between cool and warm tones to achieve a harmonious atmosphere.
- Textures and Patterns: These elements were highlighted as significant, particularly for their ability to evoke memories and assist in creating a comforting environment. For visually impaired users, tactile elements are crucial, making textured surfaces an important consideration for accessibility.
- Wayfinding: The interviewee identified wayfinding as a critical component in therapeutic clinics. Effective wayfinding, facilitated by strategic use of colors and textures, can ease patient navigation and reduce anxiety, especially in unfamiliar environments.
- Acoustics: Acoustics were deemed essential for maintaining a tranquil atmosphere and ensuring privacy. The interviewee stressed the need for soundproofing in counseling rooms and meditation areas to protect speech privacy and enhance the therapeutic experience.
- Connection to Nature: The interviewee discussed the positive impact of nature on human well-being, particularly in the UAE, where the hot, humid climate limits natural greenery. Incorporating green elements into the clinic's design can help reduce stress and foster a sense of calm among users.

- Lighting: The role of lighting in setting the mood and enhancing psychological well-being was emphasized. Natural light is preferred for its positive effects, but in areas lacking it, artificial lighting must be thoughtfully designed to provide comfort and support mental health.
- Sustainability: The interviewee highlighted the importance of sustainability in design, aligning with the UAE's leadership in sustainable practices. Sustainable design encompasses not only material choices and energy efficiency but also the creation of spaces that promote health and well-being. The interviewee suggested that sustainability should also consider the perspective of the clinic staff, ensuring a supportive and pleasant working environment.

Overall, the interview underscored the multifaceted nature of design in therapeutic wellness clinics, where attention to detail in elements like color, texture, lighting, and sustainability can significantly enhance the therapeutic experience for both patients and staff.

A survey was conducted using Google Forms to gather insights into various aspects of work life and interior design, particularly in therapeutic wellness clinics.

Question focused on the respondents' experiences with their work life, offering options ranging from "balanced," "stressful," to "extremely stressful." The results indicated that 57.9% of the respondents find their work life stressful, with 10.5% of this group categorizing it as "extremely stressful. “Another Question explored the impact of clinic interiors on patients. A significant 68.5% of respondents believe that the interiors of a clinic have a substantial effect on their experience as patients or users. Respondents were asked to evaluate statements about multisensory design in interiors and select the most fitting description. The majority, 31.6%, perceive multisensory design as one that engages the senses in diverse ways depending on the space. Also respondents were to choose which additional spaces would be most interesting in a therapeutic wellness clinic, offering options such as a Sensory Garden, Atrium, and Open Courtyard. The most popular choice was an Open Courtyard, suggesting a preference for open, airy spaces in a therapeutic setting.

3. CONCLUSION

The study focused on exploring the impact of multisensory stimulation in therapeutic psychological clinics, with a particular emphasis on how the physical environment influences both staff and patients. The main objective was to understand the relationship between daily sensory experiences and the built environment, especially within therapeutic wellness clinics. Through comprehensive research and pilot studies, the study identified the crucial role of sensory stimulation in affecting human psychology.

Interviews with design professionals and psychologists provided valuable insights into the challenges faced in designing such environments. These discussions revealed that effective therapeutic spaces often share certain common characteristics, despite the absence of a one-size-fits-all blueprint. The research delved into various design strategies, their benefits, and their application in different contexts, guided by the regulations of Dubai for technical understanding.

As a result of the study, a framework was proposed to assist designers and architects in creating therapeutic healthcare settings that engage multiple senses. This framework emphasizes the seamless integration of multisensory design elements, social interactions, and positive diversions. Key elements include the

strategic use of colors to influence emotions, the incorporation of natural, curved forms, and the careful selection of materials to evoke positive sensory memories.

Acoustics were highlighted as a significant aspect, particularly in ensuring privacy and tranquility in counseling and meditation areas. Lighting, both natural and artificial, was identified as crucial in setting the mood and enhancing the psychological health of users. Additionally, effective wayfinding and circulation, supported by design elements like colors and textures, were deemed essential for improving the overall user experience.

The study also underscored the importance of green design, integrating natural elements to create a calming environment. Biophilic design not only enhances air quality but also aids in noise reduction, contributing to a peaceful and therapeutic atmosphere. This framework aims to guide the design of therapeutic spaces that are both functional and supportive of the holistic well-being of their users.

CONFLICT OF INTERESTS

None.

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None.

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