

2021

## Factors of Indoor Therapeutic Environment and their Effects on Patients and Health care workers

Doaa Ismail Ismail Attia

Assistant Professor of Interior Design and Furniture, Faculty of Applied Art, Benha University, Benha, Egypt, doaaattiaaa@gmail.com

Follow this and additional works at: <https://digitalcommons.aaru.edu.jo/faa-design>



Part of the [Art and Design Commons](#)

---

### Recommended Citation

Attia, Doaa Ismail Ismail (2021) "Factors of Indoor Therapeutic Environment and their Effects on Patients and Health care workers," *International Design Journal*: Vol. 11 : Iss. 4 , Article 12.

Available at: <https://digitalcommons.aaru.edu.jo/faa-design/vol11/iss4/12>

This Article is brought to you for free and open access by Arab Journals Platform. It has been accepted for inclusion in International Design Journal by an authorized editor. The journal is hosted on [Digital Commons](#), an Elsevier platform. For more information, please contact [rakan@aarj.edu.jo](mailto:rakan@aarj.edu.jo), [marah@aarj.edu.jo](mailto:marah@aarj.edu.jo), [u.murad@aarj.edu.jo](mailto:u.murad@aarj.edu.jo).

## Factors of Indoor Therapeutic Environment and their Effects on Patients and Health care workers

**Dr. Doaa Ismail Ismail Attia**

Assistant Professor of Interior Design and Furniture, Faculty of Applied Art, Benha University, Benha, Egypt. doaaattiaaa@gmail.com

### Abstract:

Patients seek therapeutic environments to receive the best medical care aiming for fast recovery. Indoor design of the therapeutic environment is essential in creating a comfortable environment reducing the patient's isolation, distracting him from its disease, evoking positive feeling and helping his rapid recovery. This study illustrated the factors of the indoor therapeutic environment that should be embedded in the design to achieve the needed results. Those factors are the connection to nature, enhancing social supports, stimulating interior design features. These factors affect positively the health care workers, helping in improving their performance, productivity, and the patient's physical, psychological and improving their health and wellbeing. The case study proposed integration of those factors in the indoor design of a dental clinic for children to satisfy patient's relaxation and comfort and create a welcoming and friendly environment.

The problem was stated in the question; Can the indoor design and furniture of any therapeutic environment impact on the psychological, physical and cognitive health of patients and health care workers? With an objective of revealing the factors of the indoor design and their effects in therapeutic environment that can make a great difference in the patient's and the health care workers' health and wellbeing.

### Keywords:

Therapeutic environment, Artwork, Daylighting, recovery, interior design, patients, health care worker, healing, factors.

Paper received 16<sup>th</sup> February 2021, Accepted 23<sup>th</sup> April 2021, Published 1<sup>st</sup> of July 2021

### Introduction:

The interior design in the therapeutic environment has raised the interest worldwide. (Ghazali and Abbas, 2012). It is a non-pharmacological environment, alternative or complementary to the pharmacological medicine, as it possesses the basic elements of sanitation (Ghazali & Abbas, 2012). Researchers found that patients exposed to a natural view with trees in their room, recover more rapidly than those exposed to brick walls (Park & Mattson, 2009). The human beings' emotions are stimulated by the different elements of the interior environment like colors, forms, light, material, and sounds. For example, crowded and noisy environments invoke negative emotions, while therapeutic music helps creating comfortable environment (Fang, Wu, Lee and Liu, 2012). Artworks can transform the isolated uncomfortable inpatients into an exhilarating place connected to the outside world and affect positively the patient's psychology (Mallay, 2002) The interior design of patient's room like widening bathroom doors can help in better ambulating the patients by the health care workers and avoiding their falls.

### Statement of the Problem:

Can the indoor design and furniture of any therapeutic environment impact on the psychological, physical and cognitive health of

patients and health care workers?

### Research objectives:

Reveals the factors of the indoor design and their effects in therapeutic environment that can make a great difference in the patient's and the health care workers' health and wellbeing.

### Theoretical Framework:

#### I. Therapeutic environments:

Therapeutic environments affect the physical, social, and psychological levels of patients to distract them from their diseased conditions and withdraw them from their indoor isolation and help in the rapid recovery. It creates a human-friendly balanced environment to increase safety, calm, and reduce anxiety, stress of patients and helping the self-healing capability. In order to generate these effects, it should implement good quality of natural lightning, healing colors, therapeutic sounds like music, bird songs, water sounds, good ventilation, decrease the degree of noise, provide interactive arts, and a view of natural indoor green space and landscape, according to each patient's needs. (Smith, 2007)

#### II. Indoor therapeutic environmental factors that enhance wellness:

In figure 1, we proposed dividing the indoor therapeutic environment factors into three: connection to nature, enhancement of the social support and stimulating interior design features.

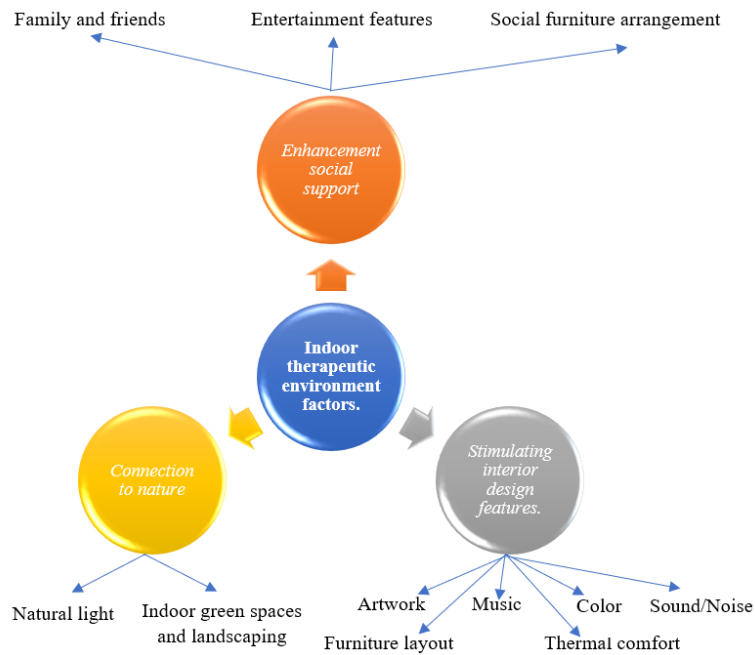


Figure 1: Indoor Therapeutic environment factors.

**1. Connection to Nature**

The connection to nature can be achieved through the views of nature, natural light and nature images. It improves health and promotes a sense of overall well-being among patients, visitors, and health care workers of a therapeutic environment. It also generates positive effects, in terms of reducing the physiological effects of stress on the nervous system, thus, inducing stress recovery and reduces sense of pain (Smith, 2007). Similarly, the nature in the interior environment can minimize attention deficit, gives greater satisfaction feeling with a variety of aspects of life and gives relaxation than the interior environment without nature. Interior design with nature also encourages positive social interactions between patients, health care workers, and visitors, enhances the spiritual well-being, reducing aggressive behavior and decreases the patient’s sense of the disease

stress (Pretty, 2004). In an experimental study, participants exposed to nature images experienced less levels of pain than those who were not exposed. (Vincent et al.2020) Other studies also showed that interior environments like rooms and interior spaces dominated by indoor plantings, pictures of nature, water features like aquariums (figure 2) and fountains, natural movement, and sound, are significantly effective in promoting recovery from stress than those lacking nature (Ulrich, 2000). Small interior gardens in therapeutic places bring nature within the reach of patients, provide green views, and improve thermal comfort of the place. Another study of children with deficit disorders, found that those children react better with less deficit disorder symptoms after their activity in natural settings with natural green interior area (Smith, 2007).

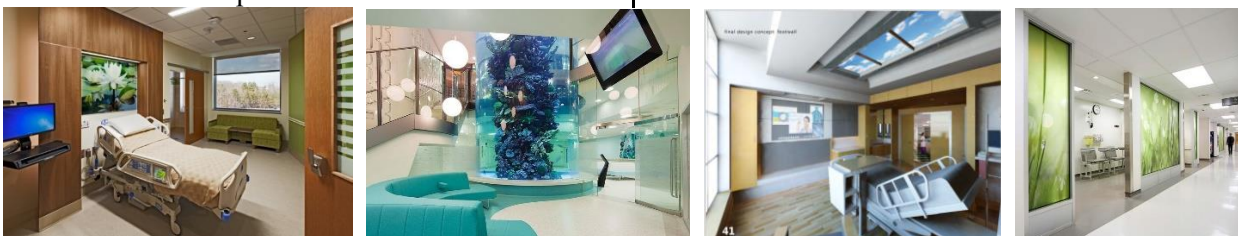


Figure 2: Indoor therapeutic environments dominated by pictures of nature, aquariums to promotes a sense of overall well-being among patients.

**Natural light / daylighting:**

Proper vision requires sufficient lightening in interior spaces. Enough daylight in patient’s rooms helps both patients’ recovery and rehabilitation, therefore, improves their health and wellbeing

(Smith, 2007). Daylight gives visual, physical, and psychological comfort, pleasantness, mental comforting colors appearance, thus, has positive effects on the general health and wellbeing. In therapeutic environments, careful using of the

natural lighting creates a dynamic, welcoming, restful, attractive interior spaces, and a pleasant ambience associated with improved attention and mood, reduced strain, anxiousness, tiredness, and eyestrain (Meenakumari, 2017) (Figure 3). It also improves brain's cognitive function, reduces feeling of isolation. The sunlight has an important therapeutic role as it activates vitamin D in the skin, this is linked to the production of serotonin hormone responsible for the sense of happiness and regulate the circadian rhythm of the human body (Meenakumar, 2017). Daylight in therapeutic environments creates a positive environment and

can save energy and maximize occupant's comfort, reduces the feeling of isolation, thus helps in reducing depression among patients, and the length of hospital's stay. an example for that is the covid-19 patients that requires long time of isolation in a healthy environment with proper day lightning offering the vitamin D which has an important therapeutic role in the disease. For the health care workers, the exposure to the daylight will help improving their performance, psychological state and inner satisfaction (O'connor et al. 2012)

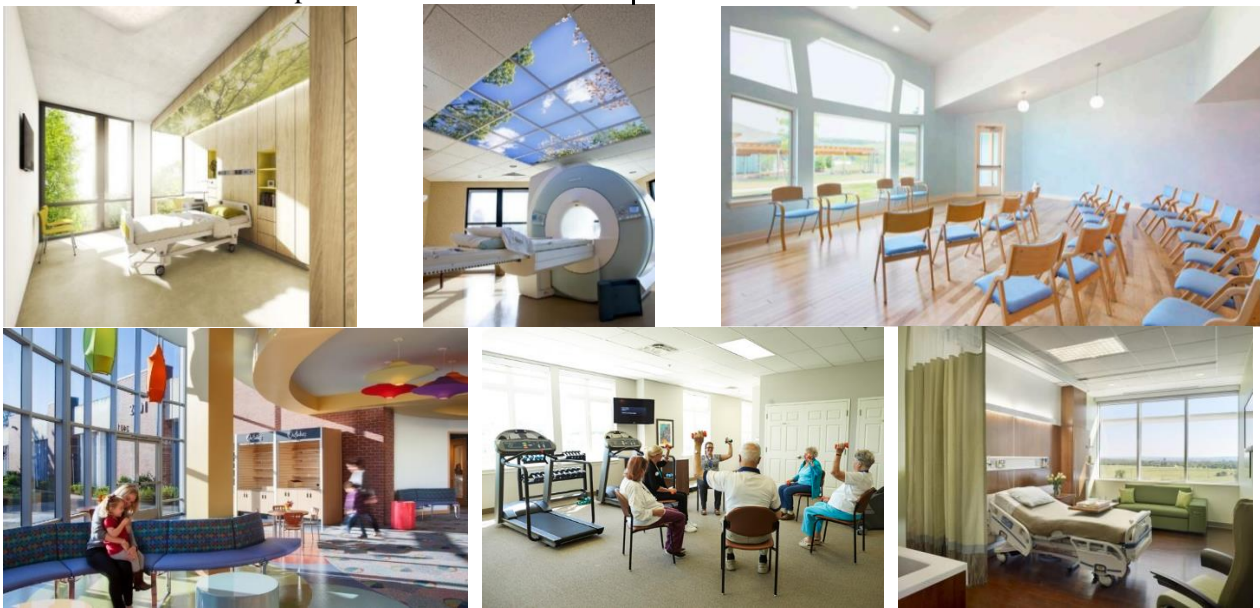


Figure3: The natural light in different areas in therapeutic environment reduces feeling of isolation, stress and creating a positive healthy environment.

#### ***Indoor green spaces and landscaping:***

The indoor green spaces with different shapes, colors and textures play a fundamental role in any therapeutic environment to enhance the patient's physical, psychological and cognitive health. Incorporating indoor natural scenes like trees, green vegetations and cultivated fields reduce anxiety and result in positive therapeutic outcomes for patients (Ulrich 2000). Also, the view of green spaces through windows or the presence of bedside green leaves increases the patient's visual connection to nature, provides an aesthetic feeling, which reduces stress, improves wellbeing, and hastens the patient's recovery (Figure 4). (Pretty , 2004) Studies found that indoor plants and landscapes can mitigate urban sprawl and sick-building syndrome through, improving the air quality and purifying it from pollutants and reducing the quality of spores and air borne microorganisms and can reduce noise by

absorbing different sounds' frequencies. (Park & Mattson, 2009) The artistical distribution of green spaces, with its seasonal changes, in the interior therapeutic spaces, elaborates effective mental security, tranquility and comfort Studies showed that gardens in therapeutic environments help in improving the patient's quality of life and encourage them to practice their exercise in the nature (Park & Mattson, 2009). The view of plants has a therapeutic role in surgery, preoperatively, plants are able to provide a positive distraction from worrisome thoughts and elaborate positive mood and restoration from stress (Ali khan et al,2016). During surgery, plants are linked to pain reduction, thus, lowering the need for analgesia. Post-operatively, they reduce analgesic pain medications and complications. (Park & Mattson, 2009)



Figure 4: Natural views create a safe, comfort and relaxing therapeutic environments, therefore, improves wellbeing, hastens the patient’s recovery, reducing the average length of stay in hospitals and save money.

Source: (Wilson ,2015)

**2. Social Support**

The social support in therapeutic environment includes three components: social furniture arrangements, entertainment features and family and friends. Social furniture arrangements can support wayfinding aspects, and directly affect the potential for social interaction. It encourages moveable interaction, provision of comfortable interpersonal distances, ease the eye contact, and physical comfort during conversation (Figure 5). Moreover, sufficient space in patient’s rooms and

waiting areas can provide more opportunities for social contact. Entertainment features, such as watching television, music, media literature, allow more interactive contact among users in the therapeutic environment. In therapeutic environment, social interaction is an attribute affecting the wellbeing of patients, health care workers, and family, also reinforces a sense of comfort. Studies found that longer family and friends visits to patients help better rehabilitation (Mazuch & Stephen, 2005).

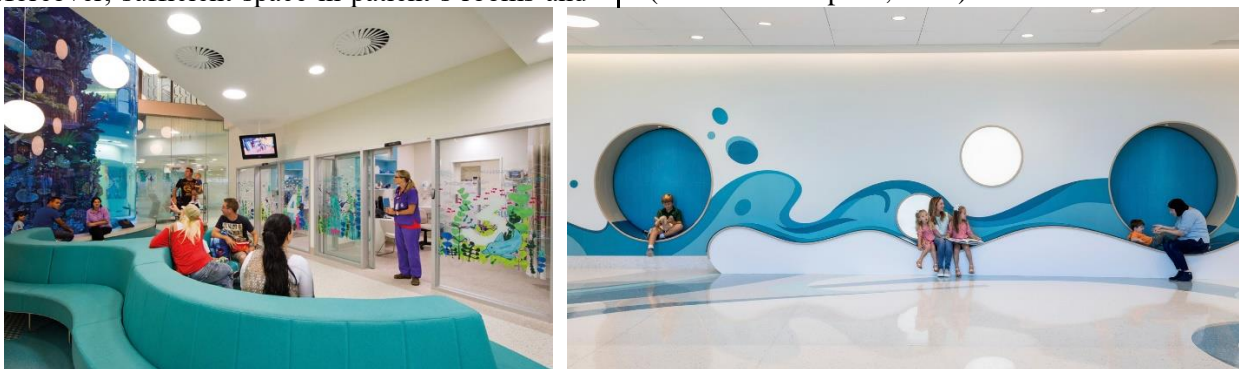


Figure 5: Different shape of furniture arrangements to achieve social interaction, provision of comfortable interpersonal distances and helps better rehabilitation.

**3. Stimulating interior design features:**

**Artwork**

Therapy and artwork together help in increasing the patient’s healing. Artwork is a way for nature to be integrated in the interiors of therapeutic environment to possess certain functions as having therapeutic values and increase sense of wellbeing to the patients and health care workers. Artworks

in therapeutic environment demonstrated a direct effect and correlation with the human physiological and psychologically reactions (Mallay, 2002), by changing emotions through the stimulating color and spaces, providing a comfortable and relaxed environment (Fang, Wu, Lee, and Liu, 2012). The artworks offer a non-verbal way to communicate, thus transform an

isolated hard therapeutic environment into a positive place, connecting the patient with the outside world and hastening its recovery. The nature scenes of artwork like calm or slowly moving water, flowers, Savannah-like properties, and birds provide a positive feeling, promote continuous attention and interest, reduce anxiety, and help to adjust diagnosis and reduce pain (Mallay, 2002). A study found that anxious patients in a dental clinic were less stressed when a large nature mural was hung on the wall of the waiting room in contrast to a blank wall (Ulrich, 2000). The Art therapy has a psychotherapeutic healing effect on

the well-being of patients and health care workers. Art therapy increases autonomy concentration and self-confidence and fulfills natural needs to be creative, therefore, helps patients to make changes in their way of thinking and consequently move forward. Art therapy may use a variety of art methods including drawing, painting, sculpture and collage. Selection of the appropriate artwork and colors is challenging in any therapeutic environment, since using the inappropriate ones can evoke negative effects as well as increase stress, resulting in bad outcomes. (Mallay,2002)



Figure 6: Artwork in radiology rooms for adults and children to encourage the patient comfort and reduce fear.

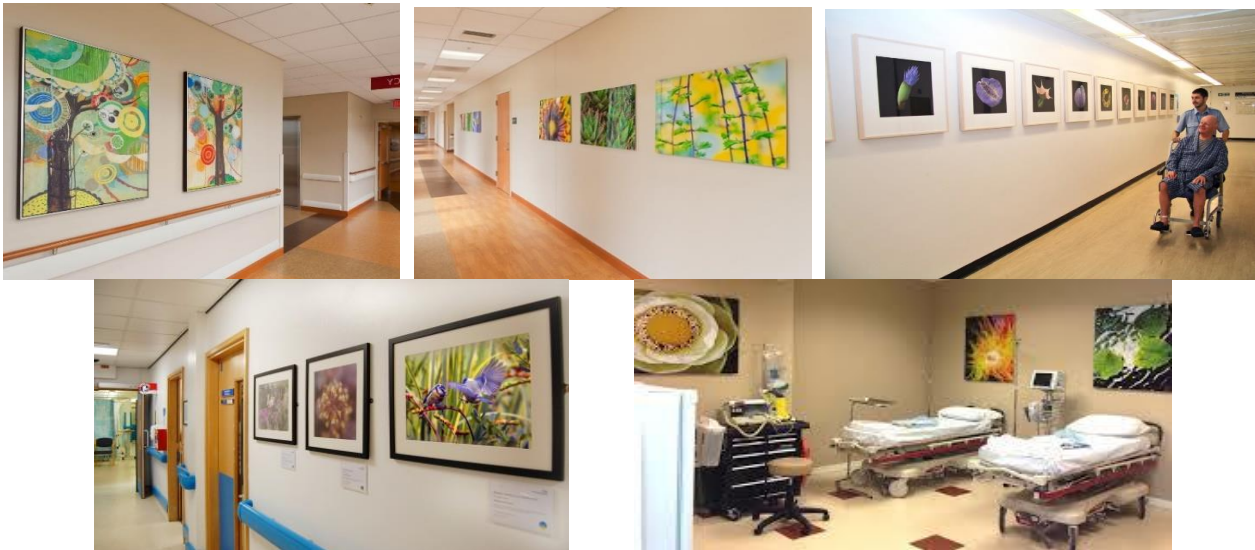


Figure 7: Artwork in the corridors and patient's room in hospitals

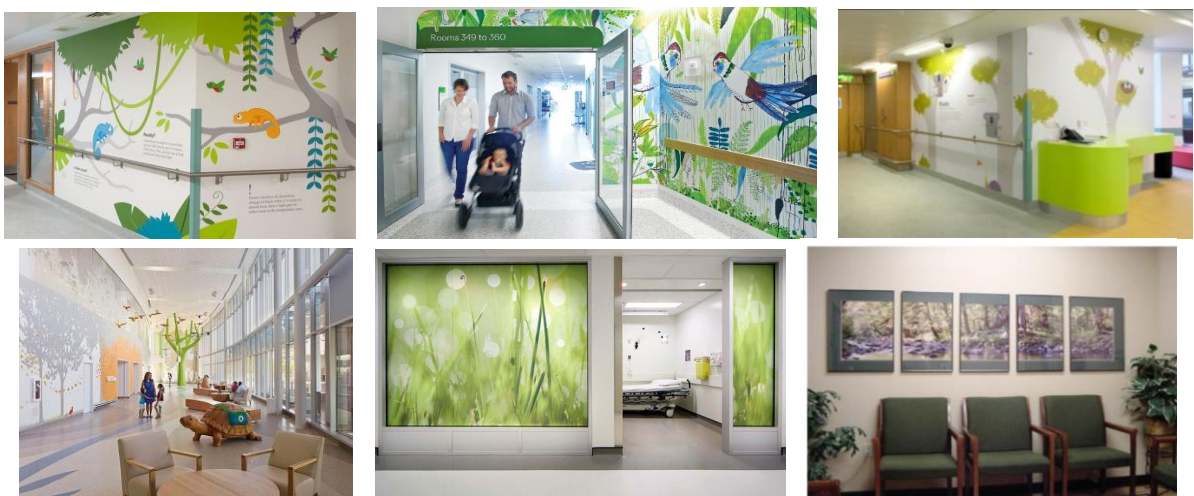


Figure 8 : Artworks with blended colors in corridors of children therapeutic environment, reception and waiting area

**Sound/ Noise:**

The sound is a vital part of the therapeutic environment. The natural sounds have positive effects on the human health and wellbeing, thus, influence the patients' behavior (Alvarsson, Wiens & Nilsson, 2010). The noise is a significant environmental stressor in the therapeutic environment. Studies revealed that unwelcomed sounds have negative psychological and physiological effects on patients and has deleterious effects on the health and healing process. (Cunha and Silva, 2015) These effects include disturbed sleep, headaches & pain, increased stress levels, negative physiological changes, difficulty in communication, altered memory, increased agitation, aggressive behavior, depression, anxiety, psychiatric disorders and speech difficulties. (Dubbs, 2004) Noise induces also biological changes as decreased oxygen saturation, elevated blood pressure, increased emotional exhaustion and increased respiratory rate in therapeutic environment. (Mazuch and Stephen, 2005) Regarding the healthcare workers, noise increases anxiety and emotional exhaustion, which lead to decrease productivity and performance of error and inability of proper communication. The source of noise in therapeutic environments arises from moving vehicles, trolleys, the sounds of telephone/alarms, nearby patients and therapeutic equipment's, loud volume of television and conversations between the health care workers. Reducing noise in therapeutic environment can be achieved by using high performance sound-absorbing ceiling tiles, floor, wall. (Ampt, Harris, & Maxwell, 2008)

**Music:**

The therapeutic music is considered a way of healing, that can influence the body and mind with the intention to bring them into a state of harmonious health. The therapeutic music has the ability to mitigate the physiological and psychological stressors, experienced by patients undergoing medical procedures (Pigliatile et al. 2019). Music therapy is an interactive treatment between the patient and music in the form of listening, playing, and singing activities practiced by the patient in the presence of a specialist (Robb, 2000). Relaxing music provides great benefits to both patient and health care workers, and its application in the therapeutic settings have the potential to decrease anxiety and stress, heart rate, blood pressure, and pains in patients. Music therapy has its effects on patient's recovering from cancer surgery, mitigating the physical state of patients with disabilities, including stroke, dementia, and psychiatric disorders, treating

anxiety and depression in patients with Alzheimer's disease (Pigliatile et al. 2019). Therapeutic intervention using the sound of music gives a comfortable environment, promotes more relaxed mind and well-being for patient's recovery from illness and surgery (Cooke, Chaboyer & Hiratos, 2005). Music therapy is effective in calming stress reactions associated with fear in patients undergoing cerebral angiography, inducing sleep, reducing muscle tension for the purpose of relaxation, depression, anxiety, and length of hospital stay in female breast cancer patients after radical mastectomy (Zhou et al. 2015). Studies found that music used during the stressful situations and the anesthesia has an anxiolytic effect resulting in increase of patient's comfort and endorphin levels, lowering of heart rate and anxiety, and reduction for the need of anesthesia or pain medications (Cooke, Chaboyer & Hiratos, 2005). Studies also found that therapeutic music plays a positive support to avoid isolation of hospitalized children (Robb, 2000).

**Color:**

The color influences the perception of the users of the therapeutic environment like the dimension; small or large, narrow, or broad, the hygiene; hygienic or non-hygienic, and the lightness; light or dark and orderliness; order or messy. This consequently affects the feelings of the patient, health care workers and visitors. Studies showed that colors can play a part in the therapeutic process as they have impact on the nervous, respiratory, and cardiovascular systems. They also affect the physiological responses as eye blinking and the mood, as well as, the emotional responses, thus eliciting peaceful feelings, mitigating stress, and inducing positive behavior (Jue & Kwon, 2013). The therapeutic effect of colors in the interior environment has an evidence-based design approach on the human body like promoting the sense of well-being, treating anxiety, fatigue, and depression, improving sleep disturbances, circadian rhythm, lowering blood pressure and muscle tension, improving way finding, increasing patient satisfaction, increasing health care workers morale and productivity. (Ghamari & Amor, 2016). The contrast of colors enhances the visual sense of patients, thus affects the mood and behavior, encourages activity, while boring colors bring gloomy feelings and passive behavior. Colors have diagnostic and therapeutic role in the mental illnesses. The violet color has a spiritual effect, reduces stress, creates inner calm, decreases the congestion of the head and sinuses, and calms the nervous system. The white color generates a feeling of clarity and luminosity,

enhances the eye focusing ability. The green color has a calming as well as a healing effects on the human cell structure and muscles, thus, relieves stress, the heart and blood problems. The blue color lowers the heart rate, has a healing power, and improves the immune system, thus, reduces the time needed by the body to heal itself, relieves tension, stress, insomnia, anxiety, lowers high blood pressure, helps in relieving migraine and skin irritation and problem with the immune

system. The red color raises blood temperature and stimulates circulation which is used in patients with anemia, fatigue, and exhaustion. The yellow color has a digestive effect of the liver and intestine and it helps also in relieving arthritis. On the other hand, the designers avoid using blue color in cardiology wards because it interferes with the proper diagnosis of the diseases. (O'connor,2011)



Figure 9: Color can be integrated in the therapeutic environment over the walls, floors, ceilings and furniture's fabrics.



Figure 10: Using warm color in different spaces adds more vitality in combination with the white color gives stability and safety.

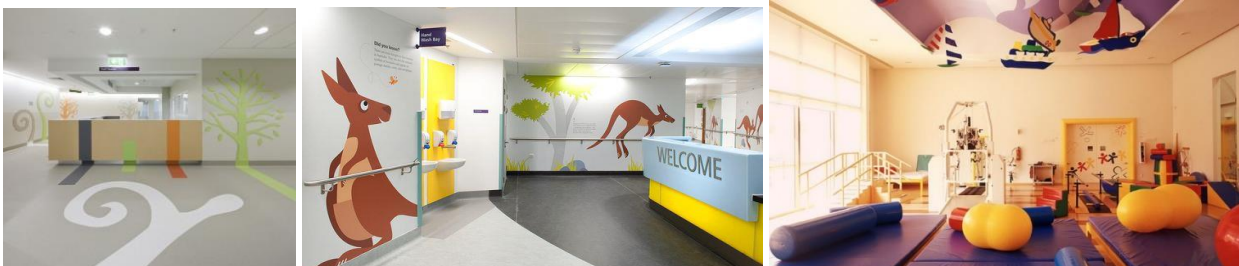


Figure 11: Using the suitable colors with different shapes in reception desk, corridors, and exercise areas in therapeutic environment to increase the patient's vitality, activity, and joy.

#### **Material:**

The different materials and their physical properties affect the therapeutic environment on the functional and aesthetic levels and consequently, their occupants. Therapeutic interiors environment materials have physical properties like safety, easy cleaning, maintenance, and appropriateness for different usages. The finishing materials and their important level to the work environment play a considerable role in the interior therapeutic environment. The finishing materials are classified into; natural, converted, and artificial materials. An example of the finishing materials are the floor material durability and its maintenance, the hard surface flooring, and its resilient properties, like sheet vinyl with

compact homogeneity or heterogenic, compact linoleum or other sheet materials, also the vinyl composition tile (VCT), porcelain pavers, ceramic tile. This finishing materials with its different physical properties can be appropriate in the different areas like emergency care, nurse stations, corridors, examination, and inpatient rooms where intervention conditions can occur, and infection control is important (Ulrich,2000). The use of natural materials, like wood and glass, increases the sense of serenity in patients and positively creates a calm and comfortable therapeutic environment with efficient infection control (O'Connell & Humphreys, 2000). On the contrary, using unstudied manufactured material may induce physical damage and negatively affects



patients and the treatment plan.

The important level of the material in the work environment depends on its features, which affect the perception of quality of care from their users. The features include the ease of maintenance, cleaning, use, antibacterial effect, slipping resistance, noise absorbance and comfort



Figure 12: Using a solid vinyl tile with different colors, designs and HDF in the floor of the patient's room can increase productivity in high performance spaces and make patients and health care workers more comfortable.

#### **Thermal comfort:**

Indoor thermal comfort is important in the therapeutic environment because its deficit can result in undesired body physiological strain. Thermal comfort for patients is different from normal healthy people, as the physical disability affects the thermophysiology, thermal sensation, body metabolism, and blood flow as well as the control of skin temperature and the ability to sweat (Parsons, 2002) (verheyen et al. 2011). In the therapeutic environment, the occupants are identified into 2 groups: patients and the health care workers. Patients lying in bed have low metabolic rate and require higher closing insulation, while the health care workers have high metabolic rate with low closing insulation (Verheyen et al .2011). Balancing the thermal comfort in the therapeutic environment will help in increasing the productivity and performance of the health care workers as well as offering the required thermal environment for patients needed for their recovery, thus, reducing the length of hospital stay.

#### **Furniture layout:**

The layout of furniture in the interior therapeutic environment affects the physical function of the space and the psychology of patients and health care workers, as well as their social contacts.

perception. (O'Connor et.al, 2012) An example of the important level of material is using a material in walls, ceilings, floor, and furniture with the property of absorbing sounds to reduce noise, control vocal sound in the therapeutic environment. (O'Connell & Humphreys, 2000)

(Cetin, Ultav & Ballice, 2018) The patient's room requires appropriate and sufficient furniture in order to afford wide variety of functions like providing the proper medical care and assistance during the normal and emergency situation, the ease of contact with the health care workers, infection control, the separation between patients as well as the social contact with the patient's family and other patients (Figure 13,14). Therefore, furniture layout has been identified as an essential factor of patient in therapeutic environment. Furniture arrangements, intensity, orientation, size, and shape should accomplish the different activities like social interactions at waiting areas, rooms, and lounges in therapeutic environment. The design of furniture in therapeutic environment should achieve easy handling, flexibility, safety hygiene, lack of toxicity, good ergonomic and modularity as a way to help patient's functions. Furniture should also allow immobility, give an appropriate and controlled distance for dialogue, as well as contribute to socialization without any disturbance. Nurse stations are generally located in the center point of the floors in interior therapeutic environment and the other facilities surrounding it helping patient's health care workers interactions. (Tavakkoli, et al 2015)



Figure13: The design of furniture in therapeutic environment achieves the infection control and separation between patients.



Figure14: The furniture layout of patient room to afford a wide variety of functions such as contacting other patient/treatment staff /family zone.

**III. Case study: Application on children dental clinic:**

The research adopted approaches based on paper studies to satisfy the psychological and social needs of patients. Children fear dental clinics and have worries, anxiety and stress from the dental procedures, the resulted pain and discomfort. We proposed a therapeutic environment design by

applying its three factors; connecting with nature, enhancement social support and stimulating interior design features, in a children’s dental clinic to generate a friendly and welcoming atmosphere. We suggested two designs for two areas in the clinic: the waiting area and the examination room.

**First design**



**Second design**



Figure15: Two plans & sections of a children’s dental clinic with different palette of colors.

**The waiting area:**

The reception counter is placed at the entrance to welcome the patients. The clinic's logo is placed in the background to attract the patient's attention. In first design, the logo is inspired from the natural tree leaves, colored with violet and green colors.

**The first design.****The Second design**

Figure 16: Shots illustrating the design of reception counter and the waiting areas.

The furniture in the waiting area is arranged in a comfortable way to facilitate the patient's mobility and social interaction. Also, the arrangement facilitates the ease of cleaning and infection control. The furniture consists of individual chairs, which are small, circular, and colored for children, while for adults, the chairs are larger in size with neutral color. The chairs are arranged along the walls, facing each other, to facilitate social interactions. (Figure 17) In the first design, two circular wooden tables, and in the second design, two triangle wooden tables, are placed in the center with different sizes to avoid the boring feeling. Different social entertainment tools are used like television with interesting motion's picture films and nature scenes like the world of animals, different magazines, and coloring books with coloring pencils interesting for children placed on the centered table to attract their attention and distract them from the pain and stress (Figure 18). Our study revealed that nature pictures hung on walls decrease the patient's stress and anxiety, therefore a decorated large mural painting of nature is used instead of a blank wall. A mural painting with different tree leaves and plants using the same colors of the logo is used in both designs, that occupied the walls (Figure 17).

In second design, the natural tree leaves are colored with the green and aqua blue colors. In both logos the wall is white to increase the contrast between the colors and the background (Figure16). The waiting area is visible from the reception desk to help patients.

In the first design, artificial light in the ceiling is used. While, in the second design, one wall is replaced by glass to bring the natural light into the space, allowing natural ventilation, increasing connection with nature, and spreading positive feelings through interaction with the walls' colors. The used colors have different effects, the green color is the color of nature, that regulates the soul and body, helping in balancing and controlling the patient's emotions, thus, minimizing the painful feeling of the dental diseases. The violet color minimizes the neurological and psychological effects of the painful problem of patients. It decreases the congestion of the head and sinuses. The aqua blue color is a calming, light, and relaxing colors. Therefore, the use of those colors, in both designs, helps in calming and sedating the patients, preparing them before any interventional procedures. The use of those colors also affects the health care by maintaining a balanced mood during their daily work, stressful procedures, and handling with patients. The ceiling is white in color to increase contrast with the violet, green and aqua and create a pleasant feeling. The floor material used in the waiting area and corridors is vinyl tile for high performance, ease of mobility for patients and health care workers, moving

furniture, less noise and infection control, thus increasing productivity. The color of the vinyl tile is neutral to achieve the balance in the rooms. The noise level in the waiting area should be at its

minimal to minimize fear, stress, and anxiety of patients as patients collect their thoughts and feelings while waiting.

***The First design***

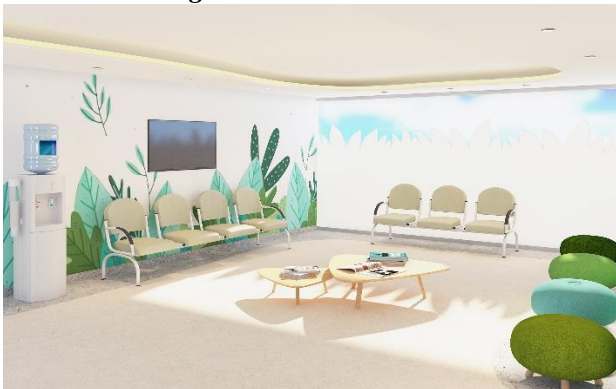


Shot (a)



Shot (b)

***The Second design***



Shot (a)



Shot (b)

Figure 17: Different shots in the two design of the waiting area to show the furniture in it is arranged in a comfortable way to facilitate the patient’s mobility and social interaction.

***The First design***

***The Second design***

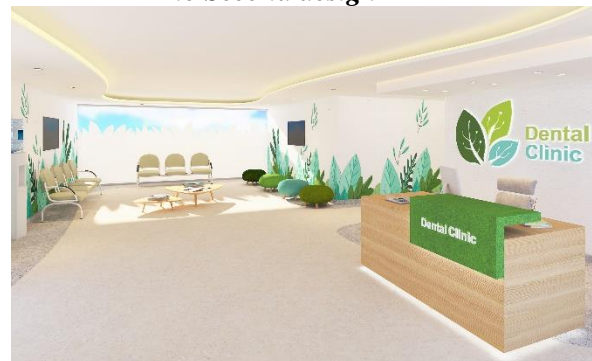


Figure 18: Different social entertainment tools e.g., television, magazines, and coloring books with

coloring pencils to attract attention and distract the children from pain and stress.

### The examination's room:

The aim of designing the examination room is creating a positive therapeutic environment with comfortable atmosphere, distracting patients from their painful conditions and the fear from interventional procedures through the connection with nature and artworks. In both designs, in front of the examination's chair, a large window with views of nature like trees and blue sky is designed, allowing the entrance of natural light and ventilation in the room and increases infection control. In the false ceiling, above the patient's chair, an artwork is used. In the first design, the artwork is a graphic design in the form of fractal spiral with the same colors of the logo to emit positive energy in the room (Attia, 2018). In the second design, the artwork is in the form of nature view of the same colors of the logo. Both artworks help in distracting the patients positively

#### The First design



from the performed procedures and decrease stress, anxiety, and pain. The chair colors of the patient's, doctor and the accompanying person are violet and white in the first design and aqua and white in the second design. The furniture in both designs is white with a violet or aqua color line according to the design. The wall of the examination room in first design is glass except the window wall and the partition between the next room while in the second design the walls are solid. The use of therapeutic music in the examination's room helps in sedating the patient and distracting him from his pain and the associated painful procedures and the noise of the intervening dentists' tools. The material of the room's floor is also the vinyl tile for high performance and productivity to achieve infection control on one hand and on the other hand create a comfortable and safe feeling for the patients.

#### The Second design



Figure 19: two examination rooms with two different designs and colors in the walls, artworks, and furniture to create a positive therapeutic environment.

### Results:

1. This study showed the positive impact of the interior design in the different therapeutic environments on the physical, psychological, and cognitive health of patients and health care workers.
2. The research revealed how the indoor therapeutic environmental factors can influence the human behaviors, actions and allowing interactions between patients, families and health care workers through their connection with nature, enhancing social support and stimulating interior design features.
3. The different factors of the interior design therapeutic environment like natural light, indoor plants, colors, artworks and adequate ventilation create an aesthetic feeling and distract patients from their diseases, improving their wellbeing and hasten their recovery as well as, increase the health care workers performance and productivity.
4. Balancing the thermal comfort provided in the interior therapeutic environment between the patients' and the working staff needs, hastens patients' recovery and at the same time, increases the staff's productivity and increase the sense of job satisfaction.
5. The properties of the material used in therapeutic environments affect the perception of design quality like easy cleaning, antibacterial ability, slipping resistance, resilience, absorbing noise and increasing the comfort feeling.
6. Music in the therapeutic environment generates a state of harmonious and comfortable environment for the patients, positive distraction, hastening their recovery and the staff increasing their productivity.
7. The furniture layout and arrangement help

achieving the different activities of the health care works including the ease of contact between them and patients, providing the proper medical care in the normal and emergency situations as well as the infection control.

8. The furniture layout and arrangement in the waiting areas help the patients' social interactions between their families, reducing stress and isolation.

### Conclusions:

Satisfying the indoor therapeutic environmental factors including the connection to nature, enhancement of the social support and stimulating the interior design features positively affect the patients and the health care workers in terms of the physical, psychological, and social levels hastening the patients' recovery and health care workers performance and productivity.

### Recommendations:

- Encouraging the designers to implement the appropriate natural lightening, indoor plants, green view or landscapes and natural artworks as well as the appropriate therapeutic music in the therapeutic environments to improve health and well-being of patients and health care workers.
- Using suitable materials, furniture and arrangement facilitating the therapeutic health care worker's performance and providing patient's comfort and social interactions.
- Choosing the appropriate colors for children, adult and elderly inpatients, diagnostic, therapeutic rooms and waiting areas is important.

### 4. Reference:

- 1- Ali khan, Muhammad, Noorul Amin, Arsalan Khan, Muhammad Imtiaz, Farmanullah Khan, Imran Ahmad, Asad Ali, Badshah Islam. 2016. "Plant Therapy: a Nonpharmacological and Noninvasive treatment approach medically beneficial to the wellbeing of hospital patients". *Gesunde Pflanz* 68(4) Doi:10.1007/s10343-016-0377-1.
- 2- Alvarsson, Jesper, Stefan Wiens & Mats E Nilsson. 2010. "Stress Recovery during Exposure to Nature Sound and Environmental Noise". *International Journal of Environmental Research and Public Health*, 7 (3);p 1036-1046. Doi:10.3390/ijerph7031036
- 3- Ampt, Amanda, Patrick Harris & Michelle Maxwell. 2008. "The Health Impacts of the Design of Hospital Facilities on Patient Recovery and Wellbeing, and Staff Wellbeing: A Review of the Literature". Sydney: University of New South Wales.
- 4- Attia, Doaa. 2018. "Using Optimal Golden-Fractal Geometrical Shapes to Generate Sustainable and Healthy Interior Environment." *International Design Journal*, 8 (4): 337-359.
5. Cetin, Cigdem, Zeynep Tuna Ultav, Gulnur Ballice, 2018. "The Effects of Interior Design Parameters on the Design Quality of Nurse Stations", *Athens Journal of Architecture*, 4, (2), P 149-170. Doi:10.30958/aja.4-2-1
6. Cooke, Marie, Wendy Chaboyer & Mary Anne Hiratos. 2005. "Music and its effect on anxiety in short waiting periods: a critical appraisal". *Journal of Clinical Nursing*, 14(2); p145-155. Doi:10.1111/j.1365-2702.2004.01033.x
7. Cunha, Madalena & Nelio Silva. 2015. "Hospital Noise and Patient Wellbeing". *Social and Behavioural Science*, 171: 246-251. DOI: 10.1016/j.sbspro.2015.01.117
8. Dubbs, D. 2004, "Sound effects: Design and operations solutions to hospital noise", *Health Facilities Management*, 17, p. 14-18.
9. Robb ,2000, "Revealed the effect of therapeutic music interventions on the behavior of hospitalized children in isolation: Developing a contextual support model of music therapy". *Journal of Music Therapy*, 37(2), 118-146
10. Fang, Yi-Wei, Chih-Hsiung Wu, Fei-Peng Lee & Wei-Min Liu. 2012. "Visitors' experiences of the art gallery at a teaching hospital". *Experimental & Clinical Medicine*, 4, (3), p 175-179.
11. Ghazali, Roslinda, & Abbas, Mohamed Yusoff. 2012. "Assessment of Healing Environment in Pediatric Wards". *Social and Behavioral Sciences*, 38, p149 - 159. DOI: 10.1016/j.sbspro.2012.03.335
12. Ghamari , H. , cherif Amor .2016. "The role of color in health care environment emergent bodies of evidence-based design approach", *Sociology and Anthropology*, Doi:10.13189/SA.2016.041109
13. Jue, Juliet, Seok-Man Kwon. 2013. "Does colour say something about emotions?: Laypersons assessments of colour drawings", *The Arts in psychotherapy*. 40(1): p115-119. Doi:10.1016/j.aip.2012.12.005
14. Mallay, Jane Neily. 2002. "Art Therapy, An Effective Outreach Intervention with Traumatized Children with Suspected Acquired Brain Injury", *The Arts in Psychotherapy*, 29(3), 159-172.

- Doi:10.1016/S0197-4556(02)00147-8
15. Mazuch, Richard and Rona Stephen. 2005. "Creating healing environments: humanistic architecture and therapeutic design", *journal of public mental health*. 4(4): p42-58. Doi:10.1108/17465729200500031
  16. Meenakumar, P.2017. "The Effects and Impact of Light on Patients and Staffs in Hospitals" *International Journal of Engineering Technology, Management and Applied Sciences*,5(6) ISSN 2349-4476.
  17. O'connor, Zena.2011 "Colour psychology and colour therapy: caveat emptor", *Color Research & Application* .36(3)p229-234. Doi:10.1002/col.20597
  18. O'connor, Margaret, Anthony O'Brien, Melissa Bloomer; Julia Morphet; Louise Peters; Helen Hall, Arlene Parry, Katrina Recoche, Susan Lee, and Ian Munro, 2012. "The Environment of Inpatient Healthcare Delivery and Its Influence on the Outcome of Care", *HERD*. 1 6(1), p 104-116. Doi:10.1177/193758671200600106
  19. Park, Seong-Hyun. and Richard H. Mattson, 2009, "Therapeutic Influences of Plants in Hospital Rooms on Surgical Recovery", *HortScience* 44 (1), p.102-105. DOI:10.21273/hortsci.44.1.102.
  20. Parsons, K.C. ,2002. "The effects of gender, acclimation state, the opportunity to adjust clothing and physical disability on requirements for thermal comfort". *Energy and Buildings*; 34(6): p593–599. Doi:10.1016/S0378-7788(02)00009-9
  21. Pigliatile, Martina, Francesco Delicati, Roberta Cecchetti, Patrizia Bastiani. 2019. "Music therapy Effects in people with Dementia", *Scholarly journal of psychology and Behavioral Sciences*.2(2) p134-147. Doi:10.32474/SJPBS.2019.02.000132.
  22. Pretty, Jules. 2004. "How Nature Contributes to Mental and Physical Health", *Spirituality and Health International*, 5 (2), p 68-78.
  23. Smith, Jerry. 2007. "Health & Nature: The Influence of Nature on Design of the Environment of Care", *The Center for Health Design*, ASLA, LEED AP
  24. Tavakkoli, Sodeh, Mohammad Mahdy Asaadi, A.H. Pakpour and Marzieh Hajiaghababaei, 2015. "Environmental psychology effects on mental health job satisfaction and personal wellbeing of nurses," *Iranian Journal of Psychiatry* 10, (3):p 158-164.
  25. Ulrich, Roger S. 2000. "Effects of gardens on health outcomes: theory and research in: C.Cooper-Marcus, M.Barnes(Eds), *Healing Gardens: Therapeutic Benefits and Design recommendations*, John Wiley Sons Inc., New York p27-85
  26. Verheyen, Jan, Nele Theys, Luk Allonsius and Filip Descamps 2011. "Thermal comfort of patients: Objective and subjective measurements in patient rooms of a Belgian healthcare facility". *Building and Environment*; 46(5), p 1195-1204. Doi: 10.1016/j.buildenv.2010.12.014
  27. Vincent, Ellen, Dina Battisto, Larry Grimes & James McCubbin. 2010. "The Effects of Nature Images on Pain in a Simulated Hospital Patient Room", *Health Environments Research & Design Journal*, 3(3), p. 42-55.
  28. Wilson, Edward O. 2015. "The economics of biophilia why designing with nature in mind makes financial sense", Terrapin Bright Green LLC.
  29. Zhou, Kaina, Xiaomei Li, Jin Li, Mia Liu, S.Dang, Duolao Wang, Xia Xin, 2015. "A clinical randomized controlled trial of music therapy and progressive muscle relaxation training in female breast cancer patients after radical mastectomy: results on depression anxiety and length of hospital stay", *European Journal of Oncology Nursing* 19(1): p54-59. Doi:10.1016/j.ejon.2014.07.010