

## The introduction of ICTs in the design of sanitary architectural environments, as a tool to help patients' therapy

La introducción de las TIC en el diseño de entornos arquitectónicos sanitarios, como una herramienta para ayudar a la terapia de los pacientes

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### Abstract

There is a reasonable number of documents on the design of hospitals and related buildings, and even on mental health facilities, but there are no psychological benefits studies for the basic design elements that are mandatory in mental health institutions. This work analyzes different aspects of ambient design dealing with seemingly minor interior choices such as texture, color, sounds / noises, decoration, and all the elements that create a mood. In doing so, we should be able to see how design decisions can affect patients' health outcomes and prove that spatial ambiances can be used to improve health, and mental health in particular. For this, a field study was conducted on a sample chosen at the Er Rasi psychiatric hospital in Annaba, in Algeria, as well as the neurology department at the Annaba University Hospital. These two categories of patients are extremely reactive and receptive to the atmosphere of the space that surrounds them, a key factor that motivated our choice. Interdisciplinary and trans-sensorial aspects, common to analysis and design, rooted in the concept of spatial atmosphere, encourage us to use the NICT (New Information and Communication Technologies) as a tool for the creation of an interactive living space evolving in real time capable of spontaneously modifying the physical properties of space, depending on the environment, to serve as a therapy for depressed people in a psychiatric environment.

**Keywords:** Atmosphere, Design, Architecture, Space, Depressive Psychiatric Patient, NICT, Psychiatric Hospital.

### Resumen

Existe una cantidad razonable de documentos sobre el diseño de hospitales y edificios relacionados, e incluso sobre centros de salud mental, pero no existen estudios de beneficios psicológicos para los elementos básicos de diseño que son obligatorios en las instituciones de salud mental. Este trabajo analiza diferentes aspectos del diseño ambiental, tratando opciones interiores aparentemente menores, como textura, color, sonidos/ruídos o decoración; y todos los elementos que crean un estado de ánimo. Al hacerlo, deberíamos ser capaces de ver cómo las decisiones de diseño pueden afectar los resultados de salud de los pacientes y demostrar que los entornos espaciales se pueden utilizar para mejorar la salud y la salud mental en particular. Para esto, se realizó un estudio de campo en una muestra elegida del hospital psiquiátrico Er Rasi de Annaba (Argelia), así como el departamento de neurología del Hospital Universitario Annaba. Estas dos categorías de pacientes son extremadamente reactivos y receptivos a la atmósfera del espacio que los rodea, un factor clave que motivó nuestra elección. Los aspectos interdisciplinarios y trans-sensoriales, comunes al análisis y al diseño, enraizados en el concepto de atmósfera espacial, nos alientan a utilizar NICT (Nuevas Tecnologías de la Información y la Comunicación) como herramienta para la creación de un espacio interactivo que evoluciona en tiempo real, capaz de modificar de forma espontánea las propiedades físicas del espacio, dependiendo del entorno, para servir como terapia para personas deprimidas en un entorno psiquiátrico.

**Palabras clave:** ambiente, diseño, arquitectura, espacio, paciente psiquiátrico depresivo, NTIC, hospital psiquiátrico.

## INTRODUCTION

To live is to move in, to develop, to move, to appropriate, to desert, to walk, but it is specially to live space (Perec, 1974). We are elements of space. Through our daily actions, our simple presence, we act and transform the space spontaneously, thus, generating a new atmosphere in space. Also “The concept of atmosphere engages a sensitive relationship to the world” (Amphoux, 1998).

At the beginning of the 20th century, Ernst Mach examines the relationship between the physical and the psychic state of individuals in the perception of sensations. He then highlights the role of movement in any perception (Ernst, 1996).

Then, Erwin Straus, in his critical works on Pavlov's reigning approach, shows that all perception engages an action, that there is no feeling without a movement (Straus, 1989). “It is not the physiological functions of sensory organs that make a being a sentient being, but rather this capacity to approach, and this one does not belong to sensation or movement alone” (p. 378).

Later, Merleau-Ponty puts forward no longer the object that would be felt and approached, but the sensible quality as the very place of perception, as the place of encounter with the world. The feeling would be the approach and the perception would then be the movement (Augoyard, 1991): “therefore, if the perception as an approach is opening to the world itself, each experience is a presentation of this world and not the apprehension of an object”.

Gibson demonstrates that space is not qualitatively neutral, but that it has permanent potential for action. The space gives an infinity of possibilities of diverse and ephemeral actions, “affordances” (offerings).

Since many architects claim an attitude that considers the sensitive, comprised with the social context as much as with the physical environment, the space where we live should then become multi-sensory, dynamic, and relational. And contemporary architecture feels explicitly concerned by these aspects.

On this topic, architects often possess an intuitive knowledge and know-how that can produce architectures of high quality, both from the sensible point of view as much as from the usability point of view.

Today, we are in the era of nanotechnology, super materials and advanced techniques, therefore, NICT have become the new master words in all possible and imaginable fields, so why not integrate them into architecture in general and space in particular? Why not create a triadic interaction: Space- Patient-NICT?

### The interactive sensory space

The space where we live is not just an object for the three-dimensional gaze. It is a complex environment. We hear sounds, we feel the wind, the heat of the sun, the temperature of the air, we walk through it, we touch it, we graze it, etc. In short, we experience it through our senses. In the Western culture, we often tend to consider that it is essentially through vision that we apprehend space (Augoyard, 1991).

It is, therefore, with our five senses that we live it. Given by a set of perceptions, space is ultimately felt by our actions, our movements and displacements; the space is “sensitive”.

All the elements of a space have relationships among them. This set of relationships defines an active space. Through our actions, our perceptions, our mere presence, we maintain a permanent relationship with space and the elements that are there (and whatever their nature). This relationship takes place with the built environment, with the social context and the sensitive elements of space.

### **The influence of space via NICT on the psychic of depressive people**

Harold Searles emphasizes that all mental illnesses affect perceptual cognition, so it is imperative that the design team considers visual, acoustic, haptic, temporal, and olfactory sensitivities in their designs, not just to avoid excessive sensory pollution (such as street noise and kitchen smells), but to avoid distortions in general. Echoes have been found to disturb patients who hear voices in anyway (Osmond, 1957). Excessive or repetitive noise can also be disturbing, especially for patients with neurotic complications (Osmond, 1957). Thus, designing a healthy psychiatric unit is a difficult task as patients are prone to distorted perceptual systems that make them particularly vulnerable to confusing forms of construction and patterns, or even a lack of tactile, acoustic, temporal, olfactory or visual stimuli (Hall, 1975).

NICTs in these cases can help the patient by creating a space that meets their needs instantly capable of adapting to the signals they emit. Indeed, until now the individuals in general and the patients in particular were only adapting to their environment and tried to create protection mechanisms or they transformed radically or partially the space to which they were confronted. So, why not create an interaction relationship between space and the patient via NICT? Space would, thus, become alive, adaptable and adaptable in order to adjust to the psychic and physiological state of people occupying the space, or in our case, the sick. When the space becomes intelligent, it transforms into a major tool in the patient’s healing process.

### **Space can participate in healing the patient**

The world, as it is designed, is not just a collection of perceptual demands waiting to trigger psychotic and other symptoms of mental illness. It can also protect human’s moral health. The attention we give to familiar, predictable and non-living environments is minimal, which means that, as long as we are in a place with such qualities, we have the opportunity to “let go” or, as the scientists say, mitigate statistical patterns based on previous environmental experiences (Horga, Schatz, Abi-Dargham, & Peterson, 2014). This is a significant neurological and environmental protective interaction because the lack of environmental mitigation -- or worse, perceptual awareness-, is widely regarded as causal in psychotic illness (Fletcher & Frith, 2009).

There is a distinct environmental condition that is necessary to enable the mitigation process and I has some particular characteristics. The environments must be readable, understandable and manageable. Mental symptoms relief, psychotic episodes decrease, stress alleviation, and basic cognitive function help can be ensured by adapting special environmental ambiances.

## METHODOLOGY

Our work is based on the emotion that can be awakened by a sensitive experience of space and on its capacity to refer to other places or other times by subtle evocations that can mobilize the unconscious in order to relief depressed people in the sanitary spaces.

According to the works of Nicolas Gilsoul, the senses of vision and touch are nurtured by the configurations and the materiality of the architectural elements, the perception of the different elements of the landscape, and also by the work of light through the play of colors and the arrangement of simple volumes that amplify the movements and effects of natural light. Hearing awakes by suggestive soundscapes, murmurs, noise, silences, circulation, drops of water, and songs of birds, which prove to be essential instruments in the perception of spatial ambiances.

To confirm or refute this theory we conducted a survey of hospitalized neuropsychiatric patients. For this purpose, the

facilities chosen to perform our study were the neurology department of the Annaba CHU and the Er-Razi psychiatric hospital, also in Annaba, Algeria. The former opened its doors to the public in 1982 and it has a capacity of 240 beds. In its geo-sanitary area, it accounts for twelve communes of the Annaba *wilaya* (the territorial division in Algeria), and in addition to the bordering wilayas or provinces, in particular: Guelma, El -Taref, Souk Ahras, Skikda, Tebessa, it alone treats nearly 50 % of the patients in a state of psycho-social stress. The services provided are: adult psychiatry, child psychiatry, drug abuse treatment and psychiatric emergencies.

The semi-structured questionnaire method was adopted for this survey for a sample of 25 % of the depressed patients in Er-Razi psychiatric hospital (12 patients). The sample also includes twelve (12) of the eighteen (18) patients hospitalized in the neuropsychiatry department. The sample is constituted by a 50% of female and a 50% of male patients. In both cases, the rooms of the patients were carefully selected according to their locations in relation to the different sources of noise, light and vis-à-vis.

A long interview with the heads of services was conducted in addition to a commented visit of the premises. A questionnaire was also sent to the health care staff of the services surveyed. An observation of the places was also necessary to update the information about the existing problems and to contextualize the questions and find a way in the space.

## RESULTS

The average age in the neurology department is 31 for women and 41,6 for men. The majority of the group comes from the Annaba wilaya (50 %) and the Guelma Wilaya (25 %).

For the Er-Razi psychiatric hospital, the average age was 35,5 for women and 29 for men. The majority of the group comes from the Annaba wilaya (50 %) and El Taraf wilaya (30 %).

A 100 % of the patients surveyed in the two departments expressed a strong problem in regard to the quality of the lighting, both natural and artificial; the existence of bars in the rooms' windows in both facilities delivers a "prison-like" effect (terms repeated several times by the patients) and they also prevent the shutters from opening completely, hence, darkening the room and avoiding patients from looking out and "seeing the face of God" (expression used by the inhabitants of the region), which of course leads to great anguish. For artificial lighting, the patients ask to have a whiter and brighter light. As for the three-bed rooms, patients complain about the noise from other patients, especially in regard to nocturnal panic attacks.

As for outside the rooms, the patients stated that the corridor was too dark, narrow and long, without outward openings causing anguish and frustration. The dull and "sad" colors of the spaces increase the effect of confinement giving a dilapidation effect to the buildings dating from the colonial period.





Now, regarding the olfactory ambiances, patients declare that there is no particular smell. An indoor grouping area equipped with a television and an outdoor garden with a walkway is requested by 80% of the patients questioned. We also noticed a feeling of uncertainty among female patients in the neuronal service, who are in the rooms that have a view of the main access gate. They reveal that they cannot sleep at night because of the fear engendered by the insecurity.

The socio-economic situation was a revealing factor in the feeling of the ambiances and the notion of comfort. It was noticed that the patients coming from the high and medium classes were very demanding and dissatisfied with the conditions of hospitalization, contrary to the patients from the other social class groups, who seemed to be content and adapted to the living conditions and spatial ambiances that prevailed in both services. The relationship with the nursing staff is good or excellent and the clinical care as well as the human care seems to satisfy the patients.

The results obtained agree with those from the study performed by a Finnish team (Kontio, Joffe, Putkonen, Kuosmanen, Hane, Holi & Välimäki, 2012). They were interested in the experience of patients during isolation in psychiatric services. Through interviews, patients were able to offer suggestions for improving practices and alternatives to the use of isolation. In this case, patients suggest more humane treatment, external evaluators (mediators or chaplains), up-to-date information, written agreements and a more user-friendly environment. These measures would make isolation more comfortable. Patients would also like to participate actively in their care. So, clearly, alongside the drug treatments, the environment affects the behavior. In addition, patients would like to have a private room or a quiet place in the service where it would be possible to relax by listening to music (Kontio et al., 2012, pp. 20-21).

Another study conducted, Impact of the physical environment of psychiatric wards on the use of seclusion (Van der Schaaf, Dusseldorp, Keuning, Janssen, & Noorthoorn, 2013), states that the lowest isolation risks were found in units that are characterized by more private space per patient, a higher level of comfort, and better visibility of the surrounding environment. These factors appear to be related to the autonomy and privacy of patients, providing feelings of identity, ownership and dignity.

## CONCLUSION

We must acknowledge that the subjects of an architectural design will be very sensitive to the negative environmental characteristics. Architects can globally create “nice” and “warm” spaces, but in this case, because patients suffer from high sensitivity to the environment, architects and designers should make an extra effort; every detail should be meticulously researched and adapted to the needs of the sick. We must, therefore, design a real haven of peace if we want to achieve a spatial anti-depressant effect through our work. And this can only be achieved through the appropriate manipulation of the ambiances.

Indeed, in their study, Björkdahl, Perseius, Samuelsson, & Hedlund Lindberg (2016) investigate the experiences of caregivers using the sensory chamber. They are most often rooms which are accessible to restless, anxious or aggressive patients to



promote their appeasement. Their creation and organization were designed in such a way that they enable patients to achieve the desired appeasement; for this, a particular interest is focused on the architecture, the furniture, the harmony of the colors, the musical atmosphere, etc.

This place would allow patients to increase their self-care and, from a general point of view, the room would reduce the tension present in the service, thus, making it more comfortable. For coping to be effective (Lazarus & Folkman, 1984), the patient must be aware of handling strategies in order to lessen or even avoid a stressful event (e.g. music, relaxation, etc.). He must be attentive to alarm signals inducing a state of crisis and must be able to define his emotions by putting words on it. Reflection on coping strategies requires a lot of interview-based work with the nursing team.

Thus, the sensory chamber does not necessarily seem accessible to all patients, as they must first know their effective coping strategies before staying there. For example, the patient should be aware of the tools to reduce his anxiety to fully benefit from the aids of the room. This conception is essential because the authors of this study have shown that patients prefer to spend time alone. As a result, they find themselves isolated from their anxiety and try to address it independently, which allows them to increase their self-care.

In addition, the warning signals that prevent this state of stress and anxiety refer to the concept of stress defined by Selye (1998). In fact, the body reacts to a stressful event by increasing heart rate, pulse, blood

pressure, etc. These biological reactions can, therefore, be felt by the patient as alarm signals. The sensory chamber is a space reserved for the patient that allows a state of well-being to be found on the basis of sensory stimulation (smell, hearing, taste, touch and sight). Townsend (2010) suggests strategies for coping with stress in this same vein. It indicates relaxation techniques, music, meditation, etc.

All these interventions are applicable in the sensory chamber, and seen the patient's need for isolation in these rooms and the encouragement of the latter to self-care, the NICTs (New Technologies of Information and Communication) can prove to be a solution for the control of the ambiances. In the interaction of the patients in the space with this integrated intelligence conceived for the ambience, the patient's follow-up is done continuously and spontaneously.

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