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SENSORY SPATIAL APPRAISAL OF THE CHILD MEDICAL UNIT OF MUSTAPHA PACHA HOSPITAL IN ALGIERS

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Abstract

Mustapha Pacha hospital is one of the oldest health services of Africa. It was constructed as a shelter of injured soldiers in the 19th century during the Ottoman Regency. It has a stratigraphy of more than two centuries. Its final planning was held by Jules Voinot in and with the Champs de Manoeuvre Algiers city extension, at the beginning of the 20th. Having a ward configuration, neither its organization nor its functional basics spatial use did change, regarding the demographical or the technical needs. It is integrated in the city and vice-versa. The research takes as a case study the Children Clinical Medical Unit. It is one of the first wards of the hospital which receives more than 300 children each day. The objective of this research is to evaluate the spatial sensory criteria of children in the Clinical Medical Unit through Evidence Based Design approach. This approach consists to evaluate the impact of spaces on child welfare. This research combines three steps: First, data collection regrouping historical insights regarding the unit. Second the observation of the spatial paths hospitalization of children. Third, a photo elicitation semi structured interview in order to evaluate the main lived spaces. The outcomes will contribute to healthcare facilities refurbishment operation on sensory spatial appraisals through taste, sight, touch, smell, and sound. The study will impact the healthcare facilities architecture in Algeria and expose the need of the expertise concerns regarding the sensitive aspects of ancient healthcare architecture and architectural sensory appraisals.

Keywords

Hospital, Child perception, Evidence Based Design, Architectural heritage, sensory appraisal

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ABSTRACT: *Mustapha Pacha hospital is one of the oldest health services of Africa. It was constructed as a shelter of injured soldiers in the 19th century during the Ottoman Regency. It has a stratigraphy of more than two centuries. Its final planning was held by Jules Voinot in and with the Champs de Manoeuvre Algiers city extension, at the beginning of the 20th. Having a ward configuration, neither its organization nor its functional basics spatial use did change, regarding the demographical or the technical needs. It is integrated in the city and vice-versa. The research takes as a case study the Children Clinical Medical Unit. It is one of the first wards of the hospital which receives more than 300 children each day. The objective of this research is to evaluate the spatial sensory criteria of children in the Clinical Medical Unit through Evidence Based Design approach. This approach consists to evaluate the impact of spaces on child welfare. This research combines three steps: First, data collection regrouping historical insights regarding the unit. Second the observation of the spatial paths hospitalization of children. Third, a photo elicitation semi structured interview in order to evaluate the main lived spaces. The outcomes will contribute to healthcare facilities refurbishment operation on sensory spatial appraisals through taste, sight, touch, smell, and sound. The study will impact the healthcare facilities architecture in Algeria and expose the need of the expertise concerns regarding the sensitive aspects of ancient healthcare architecture and architectural sensory appraisals.*

KEYWORDS: *Hospital, Child perception, Evidence Based Design, Architectural heritage, sensory appraisal.*

1. INTRODUCTION

Spatial evaluation is an impactful field of study in healthcare design. (C. Andrade, Lima, Fornara, & Bonaiuto, 2012; Fross, Winnicka-Jasłowska, Gumińska, Masły, & Sitek, 2015; Zimring & Reizenstein, 1980) Evaluating designed healthcare facilities after years of use is mandatory to understand users and health practitioners needs. It is important to point out the vision of the 20th healthcare hospitals: spatial humanization in the center of medical care. (Verderber & Fine, 2000) Studies proves that even eco-friendly design healthcare facilities, with the newest technologies for users, need post occupancy evaluation (Foureur, Leap, Davis, Forbes, & Homer, 2011; Whitehouse et al., 2001) Evidence base design is a multidisciplinary approach to generate the best of healthcare essentials through design solution. (Alfonsi, Capolongo, & Buffoli, 2014; Erin Peavey & Kiley B. Vander Wyst, 2017; Friedow, 2012) Taken from Evidence base medicine (Jonveaux et al., 2013; Ulrich et al., 2008), it strives to take out the best of design elements through post occupancy evaluation (Brown, Wright, & Brown, 1997; Sherman, Varni, Ulrich, & Malcarne, 2005; Zimring & Reizenstein, 1980), spatial users experiences (Eve A. Edelstein, 2008) or even physiological measurements of spatial perception. (Ulrich, 1981, 1984, 1991; Ulrich et al., 2008).

Architects have to understand the child use of space (Abbas & Ghazali, 2012). Many healthcare design studies take adults samples as a meaningful case and result of study. In the other hand, child is (BIRCH, CURTIS, & JAMES, 2007). (Nic Gabhainn, Sixsmith, Fleming, & O'Higgins, 2007) It might be the fact that child has a complex brain development. Brain physiological development of child impacts his perception of space due to his age (Jean Piaget and Bärbel Inhelder, 1956), education, local culture, social range and through the local economic development of his hometown. (Hauser, 1997; Jean Piaget and Bärbel Inhelder, 1956).

The comprehension of child psychology is a complex field itself beside sensory appraisal evaluation (Olivier houdé, 2008) Child scientific studies are a recent field of study comparing to the interest of adults needs in different disciplines. (FAPEO, 2008) In fact, it is only in 1924 that United Nations ratified the first international convention of children rights. Its main objectives are to contribute to child well-being through health, education, and participation. In Algeria, child healthcare convention is applied since 1992. Beside free education and healthcare actions. This convention includes child participation. In 2009, the collaboration of the UNICEF and the Algerian ministry of Family and the Feminine Condition have taken the experience of evaluating children perception, attitude and right of participation. The study calls the adults attention to take into consideration child perception. It highlights the challenges of including child perception into collective actions. Beside this study, there is a particular interest regarding child use of space and particularly in the city. (Ould Madhi, 1986).

Brain is the main human organ which express senses in spaces (BIRCH et al., 2007; Juhanni Pallasma, 2005). Studies proves how architecture can be stressful on human work outcomes. In healthcare facilities, architecture is a key element to better outcomes (Papale, Chiesi, Rampinini, Pietrini, & Ricciardi, 2016). Beside, studies confirm that being hospitalized in a room with a window on natural views has more positive impact on inpatient healing than brick wall exposure (Ulrich, 1984). Besides vegetation, pets (Bishop, 2008) water views have a significant positive impact on inpatients.

ANFA, Academy Neuroscience For Architecture has developed an interest on healthcare facility evaluation through brain physiological measurement of spatial perception. (Eberhard, 2009; Edelstein, 2008) Evaluation of spaces used by hospitalized patients proves the contribution of space to heal inpatients and improves outcomes (Lawson, Phiri, & Wells-Thorpe, 2003; Pattison & Robertson, 1996).

Regarding well-being elements, we regrouped the data information about well-being indicators in healthcare design. Confronted with physical elements and senses of child in the Mustapha Pacha - Medical Unit - healthcare facility.

Stress has a negative effect on child hospitalization. Architecture can contribute as a place of stress and inconveniences. Architectural spaces linked to better outcomes – when positive to hospitalized persons- or stressful in healthcare facilities might be the room (C. C. Andrade & Devlin, 2015; C. C. Andrade, Devlin, Pereira, & Lima, 2017) as well as spaces of social interaction and leisure (Earls & Carlson, 2001; Elizabeth Bromley, n.d.). The outdoor spaces of healthcare facilities : composed of natural elements , are as well an important space of safety, positive effects and relaxation (Francis, 1995; Marcus & Barnes, 1995; Sherman et al., 2005) Being part of the memory of child it has a positive impact on child health improvement (Whitehouse et al., 2001). Reducing pain: Through entertainment, therapy Nature Sights and Sounds. Child in hospitals has to be in contact with indoor and outdoor elements. Spending more time outside with natural contacts is a healing factor (Jonveaux et al., 2013) Child design should be part of architects interests due to the complexity of the spaces and child needs. Constructive materials are part of accessibility, the comfort and the space.

Healthy spaces are important in healthcare facilities design. Emplacement of internal hospital waste management is fundamental in order to do not disturb child smell of space and his calm. Design elements: furniture has to be on child scale in order to insure a comfort of use (P.-N. Djelepy, 1952).

Our study aims to evaluate the spatial use of children in the Medical Unit of Mustapha Pacha hospital - CHU- during child hospitalization. The appraisals of the study are based on sensory evaluation of well-being indicators. (Hauser, 1997) The welfare indicators of healthcare design are difficult to point out through a literature research, due to the complexity of the field. (Adams, Theodore, Goldenberg, McLaren, & McKeever, 2010; BIRCH et al., 2007; KRAFTL, HORTON, & TUCKER, 2007).

2. METHOD

2.1 Structure of the method:

The method is structured through three steps:

- A data collection through statistics, architectural surveys and layouts to understand the organization and the use of spaces in the service.
- The observation of the child' uses of space and his interaction in the unit.
- A photo elicitation semi structured interview with the hospitalized children.

2.2 Opportunities ethic and difficulties:

Children and parents from different ranges of social, economic and educational backgrounds are regrouped in the service due to healthcare issues. The impact of these variants in our study is fundamental. This, offers our study a complex mission. In fact, studies confirmed that educational, cultural background are important in child well-being evaluation. (Hauser, 1997).

The difficulties were at the three different steps: difficulty to collect architectural data surveys only recent years: 1999- 2012. The inconvenience was with the difficulty to observe or to interact in the space when professors were in medical care visits and when the playroom space were closed. The inconvenience of interviewing children when they were tired from the medication or the sickness.

2.3 Presentation of the general case study and interests:

The Medical Unit of Mustapha Pacha hospital receives more than 300 children per 24h and can offer more than 108 beds. Its recognized medical services attract Algerians from all over the country to benefit from cares. It is important to explain the layout of the service in order to understand the study case choice of the spatial evaluation location. The medical care service unit of Mustapha Pacha is a complex structure composed of five main services:

- Emergency service
- Day hospital: outside inpatients.
- Pediatric and oncological services
- Vaccination services.
- Radiology services.

Our study is concerned by the evaluation of spaces used by hospitalized children. Due to children ages, both of the services are divided in two parts:

Table 1: Service of the medical unit of Mustapha Pacha and space general organization
Reference: The author, December 2017

Service	Space services	Specialty	Number of beds	Age of acceptance	Spatial location
Pediatric service	Unit 1	Pediatric	29	6 to 15	Ground floor/ main entrance
	Unit 2	Pediatric	20	0-6	A part of the First floor
Oncology service	Unit 3	oncology	29	0-6	A part of the first floor
	Unit 4	oncology	30	6-15	Second floor

Unit 2 and Unit 3 are sharing the same first floor. Both are separated by a staircase hall and host small hospitalized children from 0 to 6 years old.

The Unit 4 as a case study choice:

As a first pilot study attempt, our choice focused on the Unit 4 -Hutinel pediatric service- of the Medical Unit of Mustapha Pacha hospital child perceived spatial evaluation. The study implicated mainly children, but parents and medical staff were indirectly concerned with ethical permissions. 19 children were interviewed (table 1). The semi structured interview lasted 30 minutes with each child and with the presence of a parent.

Table 2: Age and number of the hospitalized children interviewed.
Reference: The author, January 2018

Girls		Boys		Total
8 years old	3 girls.	8 year old	4 boys.	
14 years old	2 girls	10 year old	1 boy.	
9 years old.	3 girls	12 years old.	/3 boys	
15 years old.	1 girl	14 year old	2 boys .	
Total	9		10	19

2.4 Data collection:

Due the absence of available architectural information about the case study, a historical research of the building was made in order to find any architectural surveys of the building including layouts

(Urbatecture, 1999) and any rehabilitation operation information regarding the architectural changes made from the construction of the building till recent actions. (1948-2017) This first step of the study attempts to understand the medical unit organization as well as the functionality and interaction of the space.

2.5 Observation of the children spatial use:

An observation of hospitalized children paths was held in order to understand the interaction of users and spaces. The observation was made each day during February 2018. A grid of observation was made for notetaking as well as for pictures. The grid contains: child spatial interaction information, pictures of used spaces and a commented section for any details.

The photo of the observation step were taken in natural daylight and at 12.00 were the sun effect is neutral. This led to photo Elicitation semi structured interviews with children to appraise space with qualitative criteria.

2.6 Interview:

Selective pictures of the most used spaces during the observation were used to the photo elicitation semi structured interview. Children Photo Elicitation semi structured Interviews were organized after parental ethical agreements. The semi structured interview was structured with precise question regarding the liveable spaces used by child: the playroom, the room, the corridor, the medical care room, sanitary space, the outdoor space.

2.6.1 Data and sample:

10 boys and 9 girls were chosen on the basis of their age: 6-15 years old. Some criteria of sample selection:

- The authorization of the parents and the medical team/
- The age of children
- The child ability and availability to communicate
- The temper of the child.

The Data collected, were compared to the grid established during the research regarding child spatial perceptual evaluation.

2.6.2 Plan and process of the interview:

The photo elicitation method, offers the possibility of interacting more easily with children through interviews with photo presentation. (Epstein et al., 2006) The questions were centered around the spaces used by children. They were about the feel of children and their satisfaction of healthcare service design. The semi structured form of the interview was important due to the spontaneous child interaction. The photo elicitation was important to help child to understand some questions.

3. Results

3.1 General physical aspects and senses indicators

Spatial observation offered us the starting point of the research important information: Children paths in the Medical Unit of Mustapha Pacha hospital: 6 main spaces are concerned with child spatial use during hospitalization: (1) The room space 100% of the time, (2) Corridor 100%, (3) Playroom space, (4) Medical Care Room (5) Sanitary space, (5) The outdoor space of the medical unit service 40%. Children express enthusiasm to particular spaces: the room and the playroom space. 100% of answers regarding the question of which place do you like the most here was about the playroom. 80% of them reported the sadness and bored when the playroom is closed. 80% of them adore their room too. It procures safety, calm and comfort: especially with the parent presence. The group result was homogenous between gender. Children were concerned about calm, safety, amusement and learning, comfort and outdoor access. They reported their wish to have access to the outdoor space of the service. Even if it is possible but they have to be under parent or medical staff close watch.

3.2 The playroom as a space of collective cohesion, learning and personal confidence:

They appreciate the functionality of the space: availability of games, drawing tools, laptops and toys. It is a place where they spent 4 to 5 hours per a day. The space offered them the possibility to express, to

learn and to laugh. They have the possibility to personalize the space with personal drawings and paintings. They regret the inaccessibility of the space during all the day: it is only opened from 10 to 16 due to administrative matters : availability of the psychologist in charge of the space (figure 01).



Fig. 1 The Playroom is a major space used by the child. It is personalised with creative and artistic child realisation. It offers security, calm, joy and vitality to children.

Reference: Author, February 2018

3.3 The room as a comfort, safe and secure physical indicator.

80% of the answers regarding the room were positive: children express joy while presenting their room and the physical elements composing it: 80% appreciated and “adored” the use of colours on walls and were “happy” to indicate us the figures, drawing and painting in their walls.

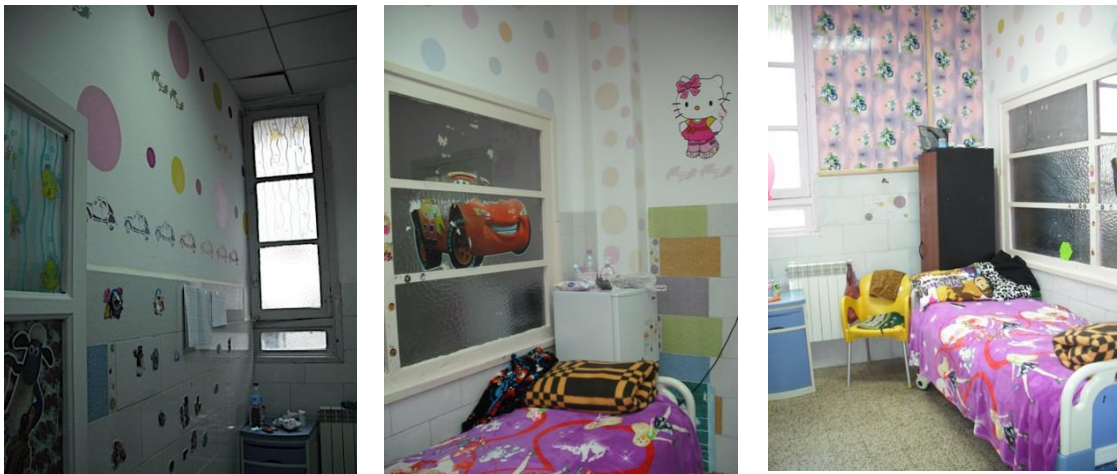


Fig. 2 The personalisation of the space by the children offered a sense of belong

Reference: Author, February 2018

3.4 The Corridor space of amusement, pain, access and freedom.

The corridor is 100% used by children in order to prospect the spaces around the room. It is a direct physical design element connecting the spatial element used by child. It is a longitudinal surface of 18m fois 2m . It connects rooms and is used by mothers during the day as a siting place. Children use it as a playground when the access to the playroom and to the outside is forbidden. It is used as a running course from 70% of children. 100 % of the interviewed boys use it as an improvised football field.



Fig. 3 The corridor is an important space of interaction between spaces and users.
Reference: Author, February 2018

3.5 The Medical Care Room:

Children express pain, tears, fright and silences when talking about the medical care room. They avoid going inside it. It is only used when medical treatment or nursing services are needed. The space is neutral: no ornaments and no colours. 100% of children (boys and girls) describe the feeling of being in danger on the space. Even if the parents accompany them or the medical staff reassure them during treatment times. They express the fear of the space.



Fig. 4 The medical care room a space felt with fear
Reference: Author, February 2018

3.6 The Sanitary space:

The sanitary space is used for sanitary needs only. The children are satisfied of the sanitary space equipment and use. The availability of water is fundamental for them. On the other hand, 40% of the children express the difficulty to have access to the washbasin “it is high and it is difficult for me to use it easily. My mom has to help me” They express as well the fear of being alone in dark angles of this space.



Fig. 5 The medical care room a space felt with fear
Reference: Author, February 2018

3.7 The outdoor space:

40% of the older children has the ability to go outside when parents are around. (from 12 to 15 year old). The others have less chance due to their parent’s availability and disposition to keep a close watch on them.

Children express happiness, joy and confidence explaining how, when and how many times they use the external space. The unit has a small external space where children have access sometimes. The access is under the medical staff acceptance and with parent are use it with the medical service acceptance and parent presence.

They feel energize (full of energy) and play around some minutes (20minutes maximum) Not all the children has the privilege to go out. Parents point out the danger of the space: presence of cars, presence of external hospital users. They do not feel safe when children ask to go out.

Child appreciate the presence of greenery and light outside. During one of the interviews, a child went out with his mother in order to stay some minutes at sunlight. He told her : “ I miss the sun”.



Fig. 6 Outdoor spaces. A space of potentialities
Reference: Author, February 2018

4. DISCUSSIONS

The objective of this study was to evaluate the spatial sensory criteria of children in the Medical Unit through an Evidence Based Design approach. Well-being indicators were exposed regarding the five sensorial appraisals of children. We also aimed to explore three steps: data collection observation with Photo Elicitation Interviews. Spatial observation led to the definition of the most used space to evaluate them. Following Evidence Based Design to evaluate child healthcare facilities, our results prove the importance of space on child well-being and medical improvements and to have better outcomes. Physical elements are indirectly outlined by children to define their architectural needs to feel better. Feeling joyful, happy and calm is part of psychological welfare.

The playroom is the place where smiles are the most seen at the hospital. Children wait all the morning to the psychologist arrival to open the doors of the space. The place provides child artistic and creative possibilities. Expressing thoughts and emotion are the best place there through ARTs. The playroom is a healing space with basic accommodation. It teaches child confidence through his creative realizations. The material used inside are part of child welfare due to the absence of comfortable furniture in the other space of the hospital like sofas or painting materials. In the other hand when it is closed it does affect child healing through waiting and the room is mainly a personal space for children in the hospital. It expresses their feelings and is their artistic gallery. Drawings, toys and personal paintings are used to design their space. Colours and stickers are partly the main perceived element for children. It offers calm and comfort to perceive a super hero facing a child bed. These elements are part of their healing environment. Child do not pay attention to other element as materials, or furniture.

The corridor is not only a space of transition but it is part of the general pacification and space interaction. Children use it to get information about the doctor presence and when medical visits time are over, they use it as a space of play interaction. Children interact more thanks to the corridor use: they exchange verbal messages to each other in order to cheer each other up. They also use it as a meeting place with external visitors: principally when NGOs come in order to cheer them up through artistic actions and educational activities. (figure 3).

The medical care evaluation shows the necessity of design to deliver change to child fear of treatment. The space should bring comfort insights to child treatment time. It has to contain more sensorial element of healing. Accommodate the medical care room as the playroom may bring positive outcomes and more confidence to child. Integrate natural views or pets interaction could attract child attention to positive senses as calm, security and safety. Designing elements for parents accompany child during cares is mandatory to enhance child confidence and ensure healing outcomes.

Sanitary room should be near, secure and comfortable to ill child. Beside his physical weakness according him attention and security provides him more welfare indicators as autonomy, safety and self-assurance. Furniture should be secure and controlled it offers child health security. Scales must we observed an increasing interest of children to go outside the service and benefit of external spaces. Patient using outdoor spaces with their parents feel better after a 20 minutes' walk or setting outside the service. Their thoughts are much positive regarding their parents and use of space. In the other hand, children with less sessions outside are more isolated in their rooms and express tiredness and solitude. Our subjective analyse confirm Ulrich theories about the contact with nature. Children are aware about their relation with outdoor. In fact, the results of room interviews exposed the evidence for child of the presence of the window in their rooms. 100% of them knows which part of the external space is seen from their room window. Trees, way finding Rating plates, cars moving around the service and even sky are perceived and felt from the children. The shadow and light game between greenery and sunlight is as well an impactful element of perception on child. Senses of warm through nature touch, smells of nature and view of nature are part of psychological healing.

Photo Elicitation methodology is a positive for this work as an element of support to semi structured interviews. Photos, in this study pointed out elements closely to child and offered more chance to explain questions during the interview. In the other hand, few issues regarding the method need to be mentioned: photos may impact child perception of space through the photo light exhibition or the angle of the shooting.

The Algerian architectural researches have to take into consideration child perception due to the importance of their perception of space. In order to offer better healing environment to the Algerian children, spatial evaluation of designed element is mandatory.

The evaluation of child liveable spaces is mandatory to understand the spatial ergonomic use and the senses expressed by children during healing process at the hospital. The use of physiological measurement should expose the impact of space on child sensorial perception. The brain function should prove objectively child architectural needs during hospitalisation.

5. CONCLUSIONS

- Spatial occupancy of hospitalized children in the Medical Unit of Mustapha Pacha hospital has some positive physical design elements which insure better outcomes.
- The better outcomes are expressed through healing environment indicators. Those are structured into environmental physical elements. Appraisal
- Physical environment should combine artificial designed elements and natural elements: greenery, pets interaction and view on water.
- Entertainment through Art and educational session in healthcare facilities promote child confidence and welfare. Integrating this approach in all the unit space is fundamental to afford children who cannot move every day to the playroom.
- Social interaction is mandatory to child development and welfare: spaces to NGOs are needed to organize child events and informative or solidarity meetings for parents.
- Architectural healthcare welfare indicators are part of sensory qualitative appraisals: touch is more for material comfort, visual is for layout organization, colours, furniture and nature appraisals in the space. Smells are part of hospital waste management and natural healing smells: aromatherapy. Hearing should be adaptable with isolation and matching acoustic building materials.

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