Environmental Evaluation of Hospital Waiting Rooms: Relationships of psycho-environmental variables

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According to some theories (Canter and Canter, 1979), physical environment can play a decisive role in the effective functioning of hospitals, since it can help promote patient recuperation and staff activity and offer a comfortable, secure, and well-attended stay for users. In order for environmental characteristics to function for and not against therapeutic work, it is necessary to pay attention not only to architectural design but also to psychological concepts, which can define the difference between a positive and a negative environment. In this sense, Environmental Psychology has generated substantial information to improve the design of hospitals, supported by systematic findings, which analyze and evaluate the interaction of human relationships between environment and behavior.

Rubin and Owens (1995), as well as Ulrich and Zimring (2004), have reviewed studies on the impact of physical environment in hospitals and reached the conclusion that most studies accept the hypothesis that environmental effects on patient health do exist. They emphasize the importance of further research in this field to suggest environmental improvements, which may favor patient recuperation. On the other hand, Shumaker and Pequegnat (1989) maintain that environmental organization and hospital design can directly affect patient recuperation or the well-being of users in two ways: one is the obstruction of effective and immediate provision of healthcare, since, from the patient's point of view, the hospital layout interferes with the movements necessary for prompt healthcare; this is supported by the results reported by Reizenstein, Grant, and Simmons (1986) and Shumaker and Reizenstein (1982). On the other hand, physical features such as deficient lighting, excessive noise, inadequate localization of medical equipment, or large distances between related areas can indirectly hinder immediate attention and create a stressful environment for users. Stress can be defined as the "condition manifested by a specific syndrome which consists of all non-specific modifications indicated within a biological system" (Selye, 1956, p. 54). However, this definition does not discriminate between psychological and physiological responses to stress. Various investigators (Baum, Singer and Baum, 1981; Evans and Cohen, 1987; Evans, 2001) have emphasized the psychological variables of stress and define it as "unpleasant physiological and psychological reactions to new stimuli which are demanding and frequently persistent" (Ittelson, Proshansky, Rivlin, and Winkel, 1974, p. 298).

For Lazarus and Folkman (1984), stress is any demand or threat that seriously challenges the person's adaptive abilities. Threat intensity of any potential stress source depends on primary appraisal, in other words the subject's interpretation of the situation, as well as secondary appraisal, or evaluation of the subject's own abilities and resources to cope with a potential stressor. Such interpretation is a function of the overall context within which the event occurs; it includes aspects of the individual's physical, social, and psychological environment (previous experiences with a given stressor, motivation, attitudes, etc.) and transactions among these three factors (Stokols and Shumaker, 1981).

Responses to a stressful event may be behavioral, physiological, and cognitive, and isolated or combined. The efficiency of a coping strategy depends on the context within which stress occurs and the individual's ability to execute it (Shumaker and Reizenstein, 1992). Constant exposure to stress can deteriorate the organism's physical and psychological resources (Selye, 1973). Patients can also become highly vulnerable to stress because their coping resources are diminished. As Folkman, Schaefer, and Lazarus (1979) point out "...a sick, tired, fragile, or somehow weakened person has less energy to cope" (p. 29). Coping resources are also diminished because of role dependency or because persons find themselves in unknown environments that depersonalize them and do not offer possibilities to control either themselves or the surrounding environment in which specific physical factors can represent obstacles to recovery. It is, then, extremely important to reduce the environmental influences that cause stress, which will otherwise jeopardize the process of convalescence or even prolong the patient's illness. Stressing factors of the physical environment at healthcare facilities can be classified, based on the theoretical assertions of Reizenstein, Grant, and Simmons (1986), in four fields: physical comfort, social contact, symbolic meaning, and wayfinding. The present study refers only to the factors that interfere with users' physical comfort, among them humidity and noise.

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A major factor in the physical environment is air temperature, which is closely related to relative humidity and air movement: at the same temperature, humid, stagnant air is perceived as being much warmer than dry, moving air. When heat is excessive, physiological regulatory mechanisms are weakened and it becomes impossible to keep internal temperature within normal limits. Symptoms are uneasiness, weakness, nausea, and in their most severe form heat shock. Other symptoms include asthenia, characterized by easy fatigue, substandard physical and mental performance, irritability, loss of appetite, and insomnia. When heat levels are above 25ºC, people become uncomfortable, irritable, and, after prolonged exposure, fatigued (Bell and Greene, 1982).

Noise is another environmental stress-causing factor. Noise is defined as unwanted sound characterized by its intensity, frequency, periodicity, and duration. Other important characteristics include predictability, source, and controllability. High noise levels (above 90 decibels) have been shown to increase catecholamine levels, blood pressure, heart rate, and skin conductance. Some research on noise shows that when subjects are instructed to reduce noise levels, cognitive effort decreases, as well as epinephrine and heart rate levels (Evans, 2001).

Acute exposure to noise under laboratory conditions produces stress, tension, and annoyance. Some studies have found that aggression and hostility increase when the subject is exposed to noise, particularly if his anger or aggression has been aroused previously (Cohen and Spacapan, and Rule and Neasdale, cited in Evans and Cohen, 1987). Noise seems to interfere with the ability to differentiate features of people who play an important role in the individual's interpersonal relationships, such as his best friend, for example. Unpredictable or uncontrollably high noise levels frequently cause a decrease of altruistic behavior or an increase of aggression. Some evidence mentions that constant exposure to noise leads to greater susceptibility of learned egotism or lack of solidarity (Rotton, Olsewski, Charleston, and Soler and Cohen, cited in Evans and Cohen, 1987).

In the case of patients in waiting rooms (McLaughlin, 1976), the waiting period can affect the expectations of the treatment they are about to receive. For visitors, the waiting period may vary from minutes to hours, in which they can be intensely bored or anxious. The size of the waiting room must therefore be planned considering the size of the expected population and anticipated waiting times. McLaughlin recommends spacious waiting rooms, with mobile furniture, which can easily be adapted to different circumstances. Thus, places to rest, talk, or be private can be created. Visual privacy can be achieved with small barriers or flowerpot stands. Acoustic privacy can be achieved by moving the furniture and with a carpet to muffle conversations.

As described, physical environment plays an important role in preventing and diminishing stress producing factors at healthcare facilities. In this area, systematic results are needed to prove the existence of these stressing agents, which will in turn allow the application of preventive or reparatory measures which may not entail great expense but will represent great benefits for institutions, patients, and users.

Based on the foregoing remarks, we propose to identify relationships between environmental conditions such as humidity and noise prevalent in hospital waiting rooms, waiting time before medical consultation, and perceptions of stress and exhaustion in patients waiting for medical consultation in three waiting rooms at a public general hospital.

Method

Site: Three waiting rooms: Room 1 is the hospital's largest waiting area, measuring 118.80 square meters. It has 79 chairs divided by a corridor in two sections; on the right side there are 40 chairs for patients waiting for their first consultation, who, for this reason, have to first pass into the emergency ward; on the left side there are 35 chairs for patients with prior appointments in the outpatient ward.

Waiting room 2 is a corridor with 48 chairs lined up on either side; it measures 66.24 square meters and is where patients wait to pass into consulting rooms 1 through 7 in the outpatient ward. This corridor has windows facing a garden on the hospital grounds fronting the street. However, because the windows are positioned high in the wall they do not provide a view of the exterior, but offer only greater natural lighting and ventilation.

Waiting room 3 is a corridor with 13 chairs arranged facing consulting rooms 8 through 15; it measures 52.92 square meters. It does not have natural lighting and is the internal access for people going to the hospital's administrative offices. Sample: 253 women of ages ranging from 15 to 79 (x = 32.16), with educational levels of 24% (61 Ss.) with primary school, 35% (88 Ss.) with secondary school, 28% (70 Ss.) with high school, 9 % (22 Ss.) with university degrees, and 3% (8 Ss.) with no formal schooling.

Measuring instruments and equipment:

The Environmental Evaluation Scale (Ortega, 2002) was used to measure evaluation and perception of physical and socio-environmental factors, which consists of 35 pairs of opposite adjectives separated by six optional answer spaces. A factor analysis of principal components was used with Varimax rotation, which explains the 43% variance with four factors. The total reliability of the scale was obtained with the Cronbach's Alpha reliability coefficient, and was 0.89. For this study the factor known as Physical Evaluation was used with five bipolar pairs: cold-hot, silent-noisy, suffocating-cool, stifling-ventilated, tired-rested, which had an Eigen value of 1.49, explaining the 4.6% variance in the Environmental Evaluation Scale with 0.57 reliability.

The Stress/Activation Adjective Check List developed by King, Burrows, and Stanley (1983) was translated and adapted to Spanish for the present study. Consists of 20 adjectives with a four-option answer scale: yes, certainly, maybe so, not sure, and not at all. Again, a factor analysis of principal components was conducted with Oblimin rotation, obtaining four factors with Eigen values greater than 1, which explain the 59% total variance. The factors are: I Stress, II Activation, III Exhaustion. For the present study we considered only the factors of stress and exhaustion. The total reliability obtained using Cronbach's Alpha was 0.56. A Realistic Digital sonometer was used to measure ambient noise. A Brüel & Kjäer interior climate meter was used to record humidity.

Procedure

Self reporting instruments were applied in the waiting rooms to patients who agreed to participate during outpatient ward service hours, and they were asked how long they had waited before their medical consultation. In parallel to this application, direct readings were taken at 30 minute intervals with the noise and humidity meters in all three waiting rooms.

Results

For a description of the environmental conditions that characterize the hospital waiting rooms studied, Figure 1 shows the intensity of environmental noise recorded (in decibels or dBA) with an average value of 59.5 dB(A) in a range of 55.17 dB(A) to 67.0 dB(A). These readings were taken over the course of a week between the hours of 8:00 and 2:30 p.m. We can observe a noise level of approximately 55-57 decibels at 8:00 a.m., which increases from 10:00 a.m. to noon with levels over 60 decibels, reaching approximately 67 decibels at around 10:30 a.m. and remaining above 60 decibels until the end of outpatient consulting hours.

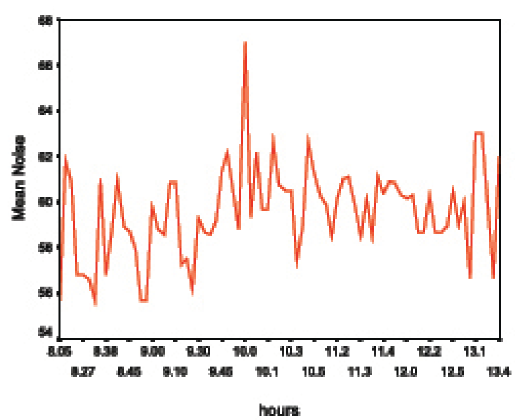

Figure 1. Mean environmental noise level in dB A in hospital waiting rooms.

Figure 2 shows mean levels of environmental humidity in the three waiting rooms; according to applicable standards, values of 50% to 60% are considered pleasant; the readings obtained in the waiting rooms occasionally fall below 50%, resulting in a low-humidity or dry environment, especially at the end of consulting hours.

As regards environmental humidity, the average was 47.7% in room 1, 55.2% in room 2, and 53.8% in room 3. Analysis of the variance revealed differences between the groups ($F_{2,215} = 154.4$, $p = .000$); on applying Scheffe's test, we found significant differences between the average environmental humidity in rooms 1 and 2 ($p<.000$) and between rooms 1 and 3 ($p < .000$).

Figure 2. Mean values of air humidity readings in waiting rooms during outpatient consulting hours. Waiting times reported by patients before receiving their medical consultation were in a range of 20 minutes and 4 hours and 30 minutes (x = 1 hour 28 minutes, DE = 1 hour); it is pertinent to mention that there are an average of 38 people in these rooms with between 8 and 62 people waiting for consultation, added to the fact that the waiting rooms are enclosed spaces with no natural or artificial ventilation.

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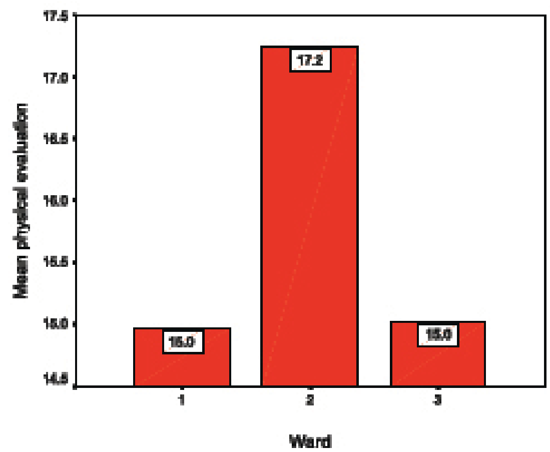
In order to determine the relationships between the perception of physical evaluation of the room and the corresponding physical evaluation, analyses were conducted with Pearson's Correlation Coefficient for the factor physical evaluation of the room and the environmental variables of noise and humidity, as well as with the factors of stress and exhaustion and waiting time, obtaining the results shown in table 1.

PHYSICAL EVALUATION OF THE ROOM	
HUMIDITY	$r = .309$ $p = .00$
NOISE	$r = -.177$ $p = .03$
STRESS	$r = -.193$ $p = .01$
EXHAUSTION	$r = -.186$ $p = .01$
WAITING TIME	$r =- .136$ $p = .05$

Table 1. Correlations between variable if physical evaluation of the waiting room and levels of humidity, noise, stress, exhaustion, and waiting time before patients went in for their medical consultation in a public general hospital.

Graph 3 shows averages for the factor "physical evaluation" in the three waiting rooms; an analysis of variance detected significant differences ($F_{2, 209} = 5.98$, $p= .00$), identifying by means of Scheffe's test ($p < .002$) a better physical evaluation in room 2 (with natural lighting and ventilation) than in rooms 1 and 3.



Graph 3. Average perception of physical evaluation by type of waiting rooms.

In other words, when patients evaluated their environment positively there were objectively observable optimum physical conditions of humidity and lower noise levels; at the same time, they reported a low level of stress and exhaustion and shorter waiting times before their medical consultation in the public general hospital for women.

CONCLUSIONS

Based on the results obtained and in the context of environmental research with a preventive orientation, we find that, using the theoretical assumptions of Environment-Individual Fit Theory (Kaminoff and Proshansky, 1982), which emphasizes the concept of maximum fit, (when the individual achieves her goals with a maximum of support and minimal interference from the physical environment) and the opposite (with minimal fit people receive a minimum of support and maximum interference from the environment), given that in our study we can identify conditions in which the physical environment does not support patients' needs or requirements during their stay in waiting rooms.

This lack of behavior-environment fit causes emotional states of stress, added to an institutional system that fails to adequately support the pursuit of goals. More specifically, measurement of physical variables presents environmentally differential conditions: in relation to type of waiting room, room 1 has the poorest lighting and the lowest level of humidity, whereas room 3 lacks windows and has a low level of humidity. In general, all three have inadequate conditions, with humidity and noise levels that exceed acceptable standards during peak hours.

Also, as regards perceptions of physical evaluation, waiting rooms are considered hot, noisy, suffocating, stifling, and tiring, especially in relation to the place patients waited and the time they had to wait. In other words, the evaluation of waiting rooms was worse when patients had to wait in an area used for transit to other parts of the hospital, which was consequently noisier and lacked adequate ventilation, and when they had to wait longer, resulting in more acute perceptions of stress and exhaustion.

In conclusion, environmentally deficient spaces produce negative differential evaluations compared with those that are environmentally better equipped or enhanced. Similarly, the social system that supports a punctual (on schedule) medical consultation is important. In other words, perceptions of stress and the resulting exhaustion are accompanied by a negative evaluation of the physical conditions of places that fail to satisfy the needs of their principal users, in other words patients. The importance of considering waiting time coincides with the findings reported by Ortega and Aguilar (2003) in the sense that models for evaluating the quality of healthcare like that proposed by Donabedian (1993a, 1993b) should include the human components of a system to achieve total quality, and in particular those that allow providers to offer prompt and punctual attention. Similarly, Frenk (2003) underscores the importance of considering objective indicators such as waiting time before provision of medical services in institutional healthcare in order to raise the quality of healthcare in Mexico.

The results of the present investigation coincide with the findings reported by Ortega, Reidl, Lopez, and Estrada (2000) in the sense that environmental conditions influence the spatial perception of hospital waiting rooms, and strengthen the validity of the previous results by measuring environmental conditions objectively add through self reporting in settings with different socio-environmental characteristics and considering patients' waiting time, and observing an increase in objective environmental indicators (noise and humidity), underscoring the importance of considering in the environment both human aspects and interior climate, noise, and waiting time before consultation, all of which directly influence spatial perception with the resulting impact on physical well being, considering, moreover, the physical and emotional vulnerability typical of the principal users of any hospital: its patients.

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