Behavioural Study of Children in Paediatric Hospitals: A Design Perspective.

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Abstract— Children often have fears and concerns regarding illness and hospitalization. Arriving at the hospital undoubtedly creates stress and fear, due to which they become insecure, anxious, threatened and unprotected. This leads to agitation, restlessness, nervousness, irritation and tiredness, adding to their stress and illness. However, a comfortably designed physical environment partially mitigates the stress of a hospital visit by providing environmental comforting. An understanding of the behavioral responses of children towards the physical environment could be translated into design to promote and encourage social interactions and social development which contributes to the comforting of children. This paper presents the behavioral tracking study of children, conducted in Hyderabad & Secunderabad, India in the spatial environment of the transitional, circulation and activity spaces of the pediatric hospital settings to find associations between the spaces and comforting of children.

Keywords— Behavior, Children, Comforting, Pediatric hospitals, Spatial environment.

I. INTRODUCTION

Children are vulnerable, by virtue of their size, incomplete development and behavior, and childhood, in general, is a psychologically vulnerable period [1]. Hospitalization is a stressful experience for children. Despite age and increased mastery, children have fears and concerns regarding illness and hospitalization. Further, [2] indicated that, in children, long hours of waiting in the outpatient clinics for medical consultations and treatments caused anxiety, agitation/restlessness, nervousness, impatience, crying, irritation, aggressiveness and tiredness, which resulted in adding to the child’s stress and illness.

Children are exceptionally sensitive to the environment and in general, children suffer from great changes in the environment and arriving at the hospital undoubtedly creates stress and fear due to which they become insecure, anxious, threatened and unprotected. Earlier, [5] believed that certain symptoms, such as increased stress, anxiety and pain experienced by patients are not necessarily part of their illness, but rather, caused by a misfit between the hospital environment and the physical, social and psychological needs of the patients. However, a comfortably designed environment might at least partially mitigate the stress of a hospital visit by way of design features that meet patient needs for bodily comfort [4].

Reference [5] indicated that in today’s context the treatment of sick children involves the factors related to the physical design of the hospitals since the surroundings affect their wellbeing both mentally and physically. Some of the physical design needs of sick children, as stated by [5] are varied spaces for different activities in addition to quiet space, private space and social space. Further, [5] also stated that the importance of the physical environment in the children’s hospitals might be noted by the change of behaviour and attitudes it can create in children. According to [6]-[7] four things in respect to their behavior are needed by children in relationship to the environment viz. need to move about in space, the need to feel comfortable, the need to feel competent and the need to feel in control. Thus, with an understanding of the behavior of children towards the physical environment, the needs transform into design, thus comforting them [8].

Children, in the hospitals confront with many difficulties that require special needs and among which, [9] indicated the comforting needs, which may be either physical, psycho spiritual, social or environmental. This paper will expand on the behavioral tracking of children in the different spaces of the pediatric settings to investigate and find the associations between the spaces and their attributes with the comforting of children to suggest design guidelines from the behavioral perspective.

II. LITERATURE REVIEW

Literature mainly focusses on the studies of the main aspects of this investigation i.e. (i)Environment and children behavior which includes both physical and spatial (ii) Spaces in the built environment (iii) Children behavior which indicate comforting.

A. Environment and Children behavior

Environment behavior is an area in architecture, which includes the systematic examination of relationships between the environment and human behavior and their application in the design process [10]. Human body reacts to a place consciously or subconsciously all the time whereas the social and physical surroundings affect the people psychologically resulting in individual development and well-being [11]. People try to establish and maintain meaningful psychological and social connections to particular objects and places while establishing a relationship with the environment which aids in designing the environment from their behavioral perspective.

Children’s daily lives are complex, unique and inherently spatial and different perspectives of large spatial environments play an important role on children’s understanding of the objects and spaces and their relationships in the environment.
Thus, children’s well-being and comforting is seen as a dynamic interaction or behavior between the child, physical characteristics and social variables of the environment [13]. Thus, from the earlier studies and views of the researchers, it may be noted that both social and physical environment have a relationship with adult and children behavior. Hence, the exploration of the behavior of children in the physical settings evolves guidelines for a comfortable design of the environment, from their behavioral perspective, thus leading to the well-being and social development of children.

A. Spaces in the built environment

Space in the built environment is organized and composed of different spaces, based on the functional aspects and convenience of the users. Accordingly, [14] classified the space under three main categories namely transitional spaces, circulation spaces and activity spaces. Further, [14] described-

Transitional spaces as those, which belong to both the outside world and inside and mediate between the two environments. They include courtyard, porch, veranda, terrace, balcony and arcaded gallery.

Circulation spaces as those, which facilitate movement for the users in a built space of unchanging location. They include corridors, aisles, lobbies and undesigned spaces used for movement.

Activity spaces as those designed, based upon functional requirements of specific activity and purpose. They may be zoned spaces closely related or adjacent, distant or isolated for privacy or other functions. Apart from these, [15] described undesigned or in-between spaces as those behind the furniture, under the stairs, under the furniture, corners and alcoves. He stated that they exhibit the quality of enclosure and facilitate movement or activity in children. The types of activity spaces differ with the building types and in this study they correspond to pediatric hospitals. Due to the restrictions of admission, the behavioral study was limited to children play areas, consultation rooms and wards in this category.

B. Comforting and Children Behavior

Comforting is more scientifically defined as creating a pleasant state of physiological, psychological and physical harmony between the human being and environment [20]. Reference [17] exclaimed comforting as soothing, relaxing, cheerful, uplifting, getting rid of anxiety, emotional escape and setting the mood.

Literature on human behavior points out that action, in and of itself can be comforting, soothing, uplifting, cheering and reduce stress, and that humans tend to be happy when taking every action over their environment [18]. Reference [14] stated that the nature of the activity performed with respect to the circumstantial factors in the physical environment, denotes comforting of the user whereas [19] said that comforting could be indicated by the actions. Hence, a framework was developed from the literature of child psychology where the child psychologists [20] refer to a variety of actions related to children’s active engagement, passive exploration, symbolic self-soothing, physical comforting, focus on desired objects and distraction in the environment as indications of comforting.

Active engagement is a strategy used by children for comforting in the environment by getting involved in engaged sustained behavior and all types of physical activities in children are indications of active engagement [21]. Passive exploration refers to an action which is an initiated action rather than self-directed. Children passively explore the environment from their tactile experiences that engage the senses, stretch the imagination and take advantage of their natural curiosity and innate abilities. Reference [20] referred symbolic self-soothing strategy of comforting as goal-directed, which requires symbolic or representational thought to achieve comforting. Physical comforting is defined as bodily-directed behaviors. Distraction or redirection of attention occurs when the child’s focus of attention is orienting from something in use to an alternative object [22]. Focus on desired objects is described by [23] as children focusing on a desired object in a delay situation.

Thus, this study explores the behavioral associations of comforting of children by applying the above strategies in observing children behavior in the various spaces of the built environment of pediatric hospitals.

III. RESEARCH METHODOLOGY

The research aims to investigate the patterns of association between different spaces and comforting of children in the built environment of pediatric hospitals. The exploration involves the identification of the variables from the data and development of patterns and theories to explain the behavior of the respondents [24] i.e. children in this study. Thus, grounded theory method [24] and multiple case study approach have been used for the discovery of patterns of association.

The present study is confined to Hyderabad & Secunderabad, the twin cities of Andhra Pradesh, India that are steering to new dimensions in the child health care sector and Observation technique was employed to investigate the associations between the different spaces in the pediatric hospitals and comforting of children.

The Non-participant unobtrusive behavioral tracking technique was applied to the observation of individual children across the settings to collect the data in the form of tracking maps, notes and photographs. This technique is the systematic following and recording of movements and actions of the respondents, in addition to observing and noting their responses in the settings, to translate them into patterns of behavior [25].

Proportionate stratified systematic sampling method [26] was adapted to ensure a representative sample of hospitals for the study. Based on the above method 16 hospitals were selected for the study out of a sampling frame of 30 hospitals since one of them had two units. A sample size of 15% of the population in each setting was decided to obtain representativeness, based on the recommendations of [26] that the sample size must be 5% of the population & an increase in the sample size would increase the precision of the sample results. The minimum tracking time for each individual was decided as 1/2 an hour, based on the view of [27] that it could be chosen arbitrarily. This was further tested and confirmed in
the pilot study. The maximum time of 2 hours was decided based on the recommendations of [28]. Thus, behavioral tracking was done for 154 children across 16 settings in this study.

IV. DATA ANALYSIS AND RESULTS

The analysis of the observation data was an inductive approach to which the grounded theory method [24] was found most suitable. Based on this method the data was systematically collected & empirically analyzed.

The tracking maps and track notes were sorted and coded based on the respondents for the convenience of analysis, developing frequencies & descriptive statistics. The data with respect to the different spaces in the settings was segregated. The categories for the spaces were evolved based on the literature explained above while the actions related to comforting were analyzed and classified based on the framework from psychology.

Associations between the different spaces and comforting of children were found by the count [29] of the children observed with respect to comfort across different categories of the spaces, to compare statistically. The count or frequencies were converted to percentages and cross-tabulated for detecting associations [30] between the two variables i.e. spaces and comforting. After detecting the associations, the significance of the associations was checked by Pearson’s chi-square test [31]. These results show that the spaces in the built environment contribute to the comforting and well-being of children in the pediatric hospitals. Then the strength of the association (strong, moderate & weak) was computed for the significant associations using Cramer’s $V$ test [30]. Based on the results of Cramer’s $V$ the different spaces could be arranged in the increasing order of their strengths of associations for the benefit of the designers.

The following table shows the summary of the statistical results in terms of significance and strength of associations between comforting of children and the different spaces in the pediatric hospitals.

<table>
<thead>
<tr>
<th>Spaces</th>
<th>Chi square</th>
<th>Significance</th>
<th>Cramer’s $V$</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity Spaces (I)</td>
<td>(x²(DF=6)=22.5P(0.001)&gt;0.05)</td>
<td>Significant</td>
<td>0.538</td>
<td>Strong</td>
</tr>
<tr>
<td>Activity Spaces (II)</td>
<td>(x²(DF=6)=20.2P(0.003)&gt;0.05)</td>
<td>Significant</td>
<td>0.496</td>
<td>Moderate</td>
</tr>
<tr>
<td>Transitional Spaces</td>
<td>(x²(DF=10)=20.4P(0.026)&gt;0.05)</td>
<td>Significant</td>
<td>0.348</td>
<td>Moderate</td>
</tr>
<tr>
<td>Circulation Spaces</td>
<td>(x²(DF=6)=14.6P(0.024)&gt;0.05)</td>
<td>Significant</td>
<td>0.332</td>
<td>Moderate</td>
</tr>
</tbody>
</table>

Note: (i) Activity spaces (I) consist of ward and consultation room spaces (ii) Activity spaces (II) consist of play spaces and undesignated spaces (iii) Associations are significant when $p < 0.05$ (iv) Association is strong when $V$ is greater than 0.5, moderate when $V$ is between 0.3 to 0.5 and weak when $V$ is below 0.3

Table 1 shows that all spaces had significant associations and activity spaces of wards and consultation rooms had a strong association whereas others had moderate associations.

V. DISCUSSIONS

The statistical and significant associations are discussed for each category of the space by descriptive inferences and illustrated with representative photographs

A. Associations between transitional spaces and comforting

The visual and physical access to nature in the different transitional spaces contributed to the comforting of children by distraction.

The scale of the space i.e. large unobstructed space in terraces & courtyards and the content (ledges, columns and steps) contributed to the comforting of children by active engagement, while the narrow & cozy space in balconies contributed to physical comforting.

The enclosure of the space i.e. openness to the sky in the transitional spaces and the visual and acoustical link created between the interior and exterior spaces contributed to the comforting of children by passive exploration.

Courtyards, which act as visual cues for way-finding, contributed to the comforting by creating a focus on desired objects, while the natural bright light, air and the content contributed to the comforting by symbolic self-soothing (enjoying & experiencing the natural air & light).

The transitional spaces encouraged social interaction and social activities, which was comforting to the children.

The following photographs illustrate the above discussions.

![Fig. 1 Views showing comforting by different strategies in different transitional spaces](image)

Thus, it can be noted that scale, enclosure, visual & physical access to nature and the content are the important factors contributing to the comforting of children.

B. Associations between Circulation spaces and comforting

The scale (narrow & long) and enclosure (cozy & safe) of the corridors contribute to the comforting of children by active engagement while the content (complexity & variety) contributes to the comforting by passive exploration.

The scale (small and large) of the movement spaces in the lobbies contribute to the comforting by active engagement, while the content contributes to the comforting by passive exploration. The visual emphasis of the content with familiarity contributes to the comforting by creating a focus on desired objects, while visual emphasis with mystery contributes to the comforting by distraction.

The following fig. 2 photographs illustrate the above discussions:
It can be noted that scale, enclosure, visual emphasis, physical access and content with respect to complexity, variety, mystery and familiarity are the important factors contributing to the comforting of children. 

**C. Associations between Activity spaces and Comforting**

In this study, activity spaces are classified and analyzed based on their function. Thus, play areas and undesignated spaces were grouped together, while consultation rooms and wards formed another group.

**Comforting by Play spaces and undesignated spaces**

The scale of the space, variety and the characteristics of the play equipment (content), acoustical & visual link with the space and finishes of the space contribute to the comforting of children by active engagement.

The visibility or visual emphasis of the space & bright colors of the equipment contribute to comforting by distraction.

The scale and enclosure of the undesignated spaces discovered by children and creating small personalized and private territories with a sense of control contribute to the comforting by active engagement.

The following photographs illustrate the above discussions

**Comforting by spaces in the wards and consultation rooms**

The enclosure, scale and content of the space in consultation rooms and wards and visual access of different territories in the wards contribute to the comforting of children by passive exploration.

The small accessible objects in the consultation rooms and the small scale of spaces around the beds, which children personalize and develop a sense of control contribute to the comforting by active engagement.

The following photographs illustrate the above discussions

**VI. CONCLUSION**

This study proved to be a scientific investigation to transform the needs of the children (specifically, need related to comforting by the environment) into design by understanding their responses and interactions with the interior architectural characteristics.

This study has made a theoretical significance by strengthening certain earlier theories and proposing new theories in the field of environment behavior, built environment and health-care settings. A methodological significance has been made by proving Non-participant unobtrusive behavioral tracking to be a systematic, non-biased, representative, credible and reliable tool for observing children in the physical settings. The findings of this research offer concrete recommendations for the organization and development of comfortable pediatric health-care settings from the behavioral perspective of children.

The investigation has explicitly highlighted the different spaces associated with the multifaceted nature of comforting of children in pediatric hospitals, thus filling a portion of gap in healthcare environment research for children. However, the ecology of healthcare environments is a necessarily changing subject for research and evaluation, and improving the patient experience will continue to be an issue for those involved directly or indirectly in the healthcare.
REFERENCES


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