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Mitigating Paediatric Anxiety Through Interactive Media in Healthcare Settings

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Abstract
An idle child [in the hospital] is less likely to be joyful than one who has something fascinating to do. Where play can be arranged under expert supervision, it is very helpful. **(Platt 1959, p.25)**
Hospital waiting spaces can be particularly stressful for children, often leading to anxiety and discomfort. Drawing from Platt's **(1959)** statement, suggesting that occupied children are happier and calmer, this research proposes a reimagining of waiting spaces with a focus on interactive, contact-free media designed to reduce stress. Utilizing Evidence-Based Design (EBD) principles, the research will focus on to how interactive media can serve as positive distraction, improving children's emotional well-being during waiting periods. The proposal seeks to be directly implemented in re-thinking and design of waiting spaces in hospitals as one of the most stressful spaces experienced by children, capturing the attention of a broad spectrum of scholars in fields including architecture, public health, psychology, and interior architecture. The ultimate intention of the research thus proposes that the findings would be further applied in promoting a less stressful waiting space in practice. Acceptance of a spectrum of methods would be applicable for the audience as long as the proposed methods underlay a legitimate adequacy.

Research Question
Can introduction of interactive Medias in hospital waiting spaces reduce children's anxiety thus promoting healthier results?

Overview
For a considerable number of patients, visiting hospital is a stressful and anxiety-provoking experience as well as promoting other negative feelings such as fear and uncertainty. Noticeably, these unfavourable psychological feelings could result in pernicious effects on recovery process **(Beukeboom. 2011)**, especially for children and their families, who may experience increased anxiety as a result of the unfamiliarity of their surroundings, fear of medical procedures, and lack of control over their circumstances. Research regularly shows that hospital environments can have a detrimental psychological influence, adding to emotions of discomfort, anxiety, and invincibility **(Beukeboom, 2011).**

Appropriately planned waiting areas can support individuals by offering a more comfortable and stress-free healthcare experience, as well as beneficial prospects regarding psychological preparation that can lower nervousness and stress. **(Tanner, 2002)**. Commentators have already agreed that the ambient environment of a healthcare setting is vital to a patients' well-being. The basic assumption is that developing visually pleasant spaces will contribute to patients' welfare by affecting their emotional responses. **(Caspari, Erikson & Naden, 2006)**.

In case of children, "playing" opportunities may augment healthcare environments by replacing exotic, disturbing spaces with more friendly ones and "studies have shown that negative behaviour can be reduced when children are given access to play prior to therapy" **(Bidis, 2013)**. It is noteworthy, that the American Association for Paediatrics (AAP) started recommending ways to stop infectious disease from spreading via hand-held toys in hospitals **(AAP Committee on Infectious Disease, 2007)**. And this fact justifies exploration of an innovative means of play updated with the latest technology and suitable for children in any level of disability to "play" with. A notable example is the Screenplay system, a large-scale interactive media that allows children to engage with digital projections through body movement, offering a contact-free and hygienic play solution **(Biddiss, 2013)**. This type of media not only provides a form of entertainment but also reduces the transmission of infections, which is a crucial consideration in healthcare settings where traditional toys are often discouraged due to hygiene concerns **(AAP Committee on Infectious Diseases, 2007)**. If the relationship between anxiety reduction via the proposed interactive media is evident, then it could be further applied for augmenting the interior quality of waiting rooms in practice which can ultimately promote stress reduction, foster patient satisfaction, thus contributing to better health outcomes for children.

Literature Review

This literature's overview is based on healthcare environments and patient's recovery outcomes examines research on EBD (Evidence-Based Design) and attempts to connect its implications and importance in constructing better hospitals. According to recent research, the reactions of children and young people to hospitalization is influenced by environmental perception, authorization, situational influence, self-determination, social support, privacy, and personal control **(Hallstrom & Elander, 2003)**. Some of the key environmental elements that are found include: activities and places; access to school; a desire for privacy and community; the use of bright colours and soft furniture, age-appropriate art work, and the elimination of dull décor **(Blumberg & Devlin, 2006).** The literature study will address three main themes: the influence of an ambient environment (views of nature, colour, light and sound), the role of patient control and participation with health care, and the availability of single-bed rooms. The study also addressed the identification of requirements and suggestions for further research.

The Ambient Environment

The ambient environment (views, lighting, and sound) has been thoroughly investigated using the standard study technique of isolating an environment variable, such as lighting, and analysing its negative or positive impacts on certain elements of patients' outcomes. Three characteristics of the ambient environment will be briefly covered in the following sections.

Views of Nature

Valuable rigorous studies have examined the psychological and physiological impacts of nature and its effect on patients' experience in the hospital. There is strong evidence that nature reduces patient assessments of pain management and anxiety. According to studies, when nature, as a pleasant distraction, is paired with natural sounds or classical music, the influence on pain reduction is stronger than when no auditory distraction is present.

On the topic of nature and its impact on pain reduction and length of stays, the existing literature assures us that nature is an effective positive distraction contributing to reducing perception of pain and as a result reduction in use of pain medications. Researchers have found that patients prefer scenes of nature over cityscapes or urban atmospheres **(Kaplan, 1972),** and that natural scenery has a beneficial influence on quicker anxiety recuperation than urban scenery. In a research done by assessing hospital records to find the effects of views outside of windows on patients healing from abdominal surgery, researchers discovered that patients in rooms with a view of nature had shorter hospital stays and needed lesser analgesic doses **(Ulrich, 1984).**

Lighting and Colour

The colour and quality of lighting in health care settings are crucial, particularly for the elderly and patients with chronic conditions. A child's capacity to feel comfortable in their surroundings is linked with a number of physical environment issues, that includes control of environment's ambient characteristics such as noise and light **(Bishop, K. G. 2008).** However, precautions must be taken to avoid direct sunlight and glare. Bright indirect lighting is preferred. "Hospitals are notorious for lacking cues as to time of day, and the resulting disorientation is well-documented" **(Kolanowski, 1992, p. 12).** A substantial quantity of convincing evidence suggests that exposure to artificial light and sunlight has a significant effect on depression reduction. The evidence that exposure to sunlight reduces sadness emphasizes the relevance of orientation and site design in healthcare buildings **(Ulrich, 2006).** Avoid site layouts that place structures in such a way that they block daylight. Access to plenty of natural light should be the main objective when developing hospitals, particularly mental health institutions.

Children value colourful designs and furnishings of rooms and corridors in any environment. Children believe that well-lit and colourful surroundings add to an enjoyable environment. The use of colour to improve mood, encourage wayfinding systems, and minimize patient confusion has been carefully investigated. Colour is an important factor in wayfinding systems in health care settings. Way-finding systems in health care settings have received limited research interest, but they may represent a promising area for future study.

Noise to Music: A spectrum

Noise is the most commonly examined environmental element linked to stress in health care settings. It is not only a discomfort, but it can also interfere with the healing process by disrupting sleep **(Simpson, Lee, and Cameron, 1996).** It causes stress on staff members as well as patients. Single bedrooms have been shown to improve several patient outcomes, including a significant reduction in hospital-acquired infection, increased patient discretion, and a decrease in noise from roommates, visitors, and staff, all of which contribute to better sleep, accelerated healing processes, and shorter lengths of stay. Research has been done on the opposite end of the spectrum, which shows that music can lessen anxiety and tension. "Music therapy effectively reduces anxiety, stress and the experience of pain" **(Guzzetta, 1989, p.610).**

Rigorous Studies on noise suggests that noise reduction could have positive impact on health in patients.
Music also is identified to have beneficial effects and could also act as a barrier for unwanted noise. As an area for future research, it should be considered that "Limited research has focused on the effects of noise on staff. A recent study found that improved room acoustics (facilitated by using sound-absorbing materials) positively affected the staff's perception of work demands and lowered their work pressure and strain" **(Ulrich et al. 2008).**

Patient Engagement with Healthcare

Lack of control is a common issue in hospital settings, which can raise stress levels and eventually have an impact on wellbeing of the patient and visitors **(Ulrich, 1992)**. Believing that we have control over any circumstances makes humans more resilient to the nuisances of everyday life. There are several methods that improve (or reduce) a patient's options while they are in the hospital. For instance, the blood donors that were in the waiting area had high levels of stress on days when the television was available instead on days when it was not, according to research on the impact of not being able to choose what to watch on television **(Ulrich, 1992)**. Ulrich (1992) came to the conclusion that stress levels were higher when there was no television option than when there was no television at all.

The patient room (size, layout, and décor) and the reorganization and redesign of the nurse stations are said to have the greatest impact on the patient's participation with healthcare **(Sherer, 1993, p. 23).**

Single Bed-Room

One design feature that improves most of patient outcomes within a hospital setting is the accessibility to a single-bed hospital room. The AIA through a study incorporated the value associated with single-bed rooms **(AIA & FGI, 2006).** Ambient noise as well as light are two most irritating factors involved within a patient's experience of a hospital setting, especially in shared rooms. Being able to control these environmental characteristics is the commonly stated reason for choosing a single-bed room. Feeling comfortable in a hospital environment is also connected to patients' ability to personalize their bedroom area with belongings of a person that can lessen his homesickness. The ability to surround oneself with familiar people and things of personal value reminding them of home, helps patients feel more at ease. Participants associate feeling at home with being calm and comfortable in their environment**. (Bishop, K. G., 2008).** Solid evidence showcases that the single-bed rooms improve the following outcomes:

Hospital Infections: Single-patient rooms reduce the spread of hospital-acquired illnesses by air, touch, and water. This benefit is acquired by increasing seclusion capacity, which facilitates the control of air quality and cleanliness of the room; also, healthcare staff' handwashing compliance may improve.

Patient Sleep: Single-bed rooms provide more privacy and less disturbance from roommates, guests, and healthcare workers.

Patient Privacy: When opposed to multibed rooms, single-bed rooms maintain auditory and visual privacy significantly better. Having no roommate in a hospital aid in the prevention of privacy breaches during patient and care provider discussions. The patients in single-bed rooms are more confident to reveal their personal information with care professionals due to improved privacy, resulting in better diagnosis and treatment.

Communication with Patients and Families: Patients in single-bed rooms show more satisfaction with communication from nurses and physicians than patients in multi-bed rooms. This contentment is the result of increased auditory privacy, which also leads to better communication between patients and families.

Staff Stress: Staff also benefit from the privacy of single-bed rooms, and studies suggest that they are less stressed than in multi-bed or open bays.

Patient Satisfaction: As previously stated, increased levels of privacy and control in single-bed rooms have led to increased patient satisfaction during hospitalization.

However, many children are not bothered by sharing a room, instead many prefer it, particularly when there is someone of their own age to play and talk to. Children expressed that having a roommate reduces the need for parents to stay overnight. Yet, the demand for having more privacy was stated in relation to other environmental challenges, such as having no personal space **(Schalkers, I., 2015).**

Conclusion

EBD is a rapidly developing and increasingly complex field. Hospital owners and designers have to make significant decisions regarding how a hospital ought to be designed based on available evidence and expertise. The study demonstrates the significant and increasing amount of reliable evidence supporting the use of certain design methodologies and attributes to enhance healthcare outcomes and the patient experience. The ultimate purpose is to make information available to designers and identify future study areas.

Research Plan

Biddiss (2013) developed and investigated ScreenPlay as a form of interactive media. A hands-on design approach and a variety of methods were investigated, including Quality Function Deployment (QFD) and Mixed Data Elicitation (questionnaires, focus groups, and observations). The authors characterize the research as a work in progress, with new projections, sound, and music included to improve the interactive experience. As a continuation of this research, I was inspired to compare the typical waiting room (without any interior disturbance such as ScreenPlay) to the setting in which ScreenPlay or another media, such as a nature movie, is displayed. A combined method approach, integrating behaviour mapping, self-reported stress levels, and examined anxiety levels, were utilized with a number of children of a certain age range. With these findings, the usefulness

of long-term installation of interactive media in hospital waiting rooms will be further assessed in order to demonstrate the practical validity of the theoretical frameworks presented in the aforementioned paper.

Proposed Tactic 1: Behaviour Mapping
As described by Zeisel, John. (2006), "observing behaviour means systematically watching people use their environments. Observers of environmental behaviour look at how a physical environment supports or interferes with behaviours taking place within it." In this case, we are particularly curious about behaviour of a particular age group of children in an equally stressful waiting space in absence and presence of an interactive ScreenPlay.

Reason
As Zeisel explains, studying behaviour in physical spaces provides information about behaviour patterns as well as expected uses, unexpected applications, and potential misuses of a space. And what about the behavioural opportunities and restrictions that the environment creates. In our research, we are particularly concerned with the potential and restrictions of waiting places, therefore the proposed technique appears justified.

Methods
In this method recording happens on floor plans, diagrams, or maps as the aim is to examine people in a waiting room at the same time. Looking at behaviour recorded on a plan gives researchers a better sense of how a whole place is used at once as Zeisel mentions.

Analysis:
Base plans with grids matching to frequent items in the actual environment might be created to provide exact physical-location data. This approach finds patterns in data using either paper and pencil or a real-time PDA application **(Zeisel, 2006)**.

Tactic 2: Standardized Questionnaires
As described by Zeisel, John. (2006), "standardized questionnaires are used for discovering regularities among groups of people by comparing answers to the same set of questions asked of a large number of people."

Reason
As discussed above; to understand and evaluate the long-term value of the proposed interactive media screen we need quantified medical stress level reports as well as a qualitative approach in documentation of self-reported stress levels. Questionnaire would be a possible useful media in helping us in the qualitative approach.

Methods
In this approach the children were asked in two different organization of waiting room (with and without an interactive media) in the same hospital to tell me about their feelings with answers such as frustrated, irritated or amused and entertained. This helped in visualizing an overall picture of satisfaction in the two different defined settings.

Analysis
Analysis of responses to questionnaires provided with precise numbers to measure the self reported amounts of stress in 2 different settings: in presence of a designed interactive media and in absence of an interactive media.

Survey Pilot Test
In the pilot test, the participants were asked to answer 10 questions on their overall waiting experiences in hospitals. 29 participants responded. The results show that most people spend around 30 minutes to one hour waiting in hospitals after reception and often they are irritated by noise and too close arrangement of seating in waiting areas.

Waiting Experience in Hospitals (Questionnaire and Analysis)**:**

Q1: In a hospital environment, would you consider a television useful for stress reduction in waiting areas?
Answered: 29 Skipped: 0

Answer Choices	Responses (29)
➢ Yes	65.51% (19)
➢ No	34.48% (10)

Q2: Play items are not provided for children in hospitals for hygiene reasons. Do you think interactive medias and apps could be alternatives for toys in waiting spaces?
Answered: 29 Skipped: 0

Answer Choices	Responses (29)
➢ Yes	62.06% (18)
➢ No	37.93% (11)

Q3: In your previous waiting experiences in waiting rooms in hospitals, what words would you use to describe the waiting room environment?
Answered: 29 Skipped: 0

Answer Choices	Responses (29)
➢ Calm	0.00% (0)
➢ Noisy	48.27% (14)
➢ Clean	17.24% (5)
➢ Grubby	0.00% (0)
➢ Pleasant	0.00% (0)
➢ Chaotic	34.48% (10)

Q4: How long did you have to wait in waiting areas in hospitals?
Answered: 29 Skipped: 0

Answer Choices	Responses (29)
➢ Under (30 minutes)	24.13% (7)
➢ Between 30 minutes to 1 hour	58.62% (15)
➢ From 1-2 hours	13.79% (4)
➢ Over 2 hours	10.34% (3)
➢ N/A	0.00% (0)

Q5: In waiting areas how would you describe seats provided for waiting patients? (Multiple answers possible)
Answered: 29 Skipped: 0

Answer Choices	Responses (29)
➢ Comfortable for long waits	31.03% (9)
➢ Uncomfortable for long waits	65.51% (19)
➢ Too close	79.31% (23)
➢ Fair distance between seats provided	17.24% (5)
➢ Enough seating provided	51.72% (15)
➢ Not enough seating provided	41.37% (12)

Q6: How would you evaluate presence of bright colours in waiting spaces as an effective approach in stress reduction in patients?
Answered: 29 Skipped: 0

Answer Choices	Responses (29)
➢ Non-effective	44.82% (13)
➢ Effective	44.82% (13)
➢ I have no idea	10.34% (3)

Q7: How would you evaluate playing music for stress reduction of patients in a waiting area?
Answered: 29 Skipped: 0

Answer Choices	Responses (29)
➢ Disturbing and stressful	0.00% (0)
➢ Calming	44.82% (13)
➢ Neutral	55.17% (16)

Q8: As an addition to a waiting area, what space would you prefer?
Answered: 29 Skipped: 0

Answer Choices	Responses (29)
➢ Cafeteria	41.37% (12)
➢ More nursing stations	0.00% (0)
➢ Vending machines	0.00% (0)
➢ Children play rooms	17.24% (5)
➢ Private waiting rooms	31.03% (9)
➢ A place for cell phone conversations	10.34% (3)

Q9: Do you prefer to have the opportunity of looking at a natural scene while waiting or digital medias which project movies/images of nature?
Answered: 29 Skipped: 0

Answer Choices	Responses (29)
➢ Natural scene	89.65% (26)
➢ Digital medias which project nature	10.34% (3)

Q10: Do you prefer an isolated waiting experience or being between other patients while waiting?
Answered: 29 Skipped: 0

Answer Choices	Responses (29)
➢ Isolated waiting is preferred	58.62 % (17)
➢ Waiting among other patients is preferred	41.37% (12)

Conclusion:
The design of hospital waiting spaces plays a significant role in the emotional well-being of patients, particularly children. The proposal to introduce interactive media into waiting areas as a means to reduce stress for children draws upon the growing body of evidence suggesting that environmental interventions can have a profound impact on health outcomes. By introducing interactive and contact-free media into waiting spaces, hospitals can provide children with engaging activities that help shift their focus away from the anxiety-provoking environment. The ability to interact with media tailored to their developmental stage and interests offers children a much-needed sense of agency and distraction, potentially improving their emotional state and reducing anxiety levels before treatment.

The research aimed to assess the impact of interactive media, such as ScreenPlay, on children's stress levels in hospital waiting areas by comparing traditional waiting rooms with and without media interventions. Utilizing behaviour mapping, self-reported stress levels, and anxiety measurements, the study sought to determine how such media could alleviate the stressful nature of these spaces. The results, including pilot survey data, support the notion that interactive media or digital content can have a positive effect in reducing stress for children. Survey data highlights that the majority of participants (65.51%) consider televisions or interactive media useful for stress reduction, and 62.06% believe that such media could serve as an alternative to physical toys in waiting areas. This is particularly relevant given hygiene concerns in hospital settings. Furthermore, 89.65% of respondents expressed a preference for natural scenes over digital projections, signalling the importance of environment-based visual stimuli. The findings suggest that integrating well-designed media and environmental factors like nature-based imagery or contact-free interactive play can contribute significantly to making waiting spaces more comfortable. These spaces often evoke feelings of noise, chaos, and discomfort as shown by 48.27% and 34.48% of participants respectively. The majority of respondents noted discomfort with seating arrangements, with 65.51% indicating that seating was uncomfortable for long waits and 79.31% suggesting seats were placed too closely together. Based on this, the study demonstrates the potential value of implementing long-term interactive media solutions to create more calming, engaging, and less stressful environments for children also underscoring the importance of thoughtful space design and the need for comfortable and hygienic environments in waiting areas. This contributes valuable insights for the rethinking of hospital waiting spaces, ultimately promoting improved patient experiences.

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