WOOD IN PSYCHIATRIC IN-PATIENT ROOMS MAY REDUCE THE LENGTH OF STAY FOR PATIENTS

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Abstract

Objective – To outline a study of healthcare outcomes for psychiatric patients within an in-patient psychiatric ward. The planned study was initiated as a follow-up of the design process, where emphasis was made to use interior surfaces of wood in a new Swedish psychiatric building.

Background –The influence of the physical environment for treatment outcomes within somatic care has been acknowledge for decades. Today there is also a growing amount of research within the field of psychiatric health facilities. View of, and access to, nature have shown to be of major importance. Recent research suggests that wood in patient rooms may have a healing effect.

Research question – Does the use of wood in psychiatric in-patient rooms have positive health outcomes, such as reduced length of stay for patients and reduced stress levels?

Method – The quantitative study will be executed in a new Swedish psychiatric building with 96 in-patient rooms in 4 wards. Each ward is divided into modules (6 patients/module). The study has a comparative approach: treatment outcomes in a module where patient rooms with wood covered facade-walls (n=2) will be compared to rooms with painted plaster façade-walls (n=2) and artificial wood panels (n=2). Patients in the module, intended for a special but general diagnosis, will be placed randomly in rooms with or without wood surfaces. All patient rooms are én-suite rooms. The staff is identical between rooms. All patient rooms have identical orientation.

Results – An outline of a study in a psychiatric hospital is presented. This includes aspects related to research design, participation from patients, ethical considerations and statistical power of the planned experiment. Final outcomes from the study will be carried out after the new psychiatric building is inaugurated in 2020.

Conclusion – Choice of building material can be an important measure to include in the design of health facilities. The study will provide new insights into what materials can be used and how they should be used to maximise possible beneficial health effects. Several aspects of architectural design can influence users in the built environment. Thus, there can be confounding factors influencing patients´ health and psychological well-being.

Keywords: *Healing Architecture | Psychiatric Wards | Wood | Construction Materials*

Introduction

The impact from built environments on public health is a complex issue that involves a large number of factors, some of which are physical and others psychological. Positive relationships between aesthetics and occupant wellbeing have been identified [1]. Over the past decades, several empirical studies have documented that both passive and active experience of nature may be beneficial for human health and wellbeing, cf. [2], [3], [4], [5], [6]. Psychological benefits have been reported on the basis of surveys and experimental data with regard to different nature experiences and in environments of varying scales, from wilderness to gardens and window views, e.g. [3].

Elements of nature and natural building materials are frequently considered to be aesthetically pleasing, cf. [7], and can thus have a positive influence on occupants´ wellbeing and health. Building materials do impact on how buildings are experienced by users and can influence the indoor environment through aesthetical properties and psychological outcomes/effects. There is a growing body of research that investigates health effects of wood in the build environment, e.g. [8], [9]. A literature review conducted in 2015 concludes that there probably are benefits from using wood in healthcare environments [10].

The connection between views to nature and improved therapeutic outcomes does, however, not mean that the use of wood necessarily would contribute to similar outcomes. In particular, the healthcare context presents complexities especially in relation to infection control, which is one of the most important constraints for most healthcare

environments. Wood is a porous material and therefore very difficult to pass infection control, on the other hand recent research provide some evidence about possible benefits from wood with respect to microbial safety in hospital settings [11].

There is a body of research on architecture for psychiatric environments and therapeutic spaces, cf. [12], [13]. Sherman concludes that objective measurement of the built environment in inpatient psychiatric settings is feasible and can be used to identify features that increase user satisfaction [14]. Design aspects in psychiatric ward design have been studied by design can promote healing and support treatments [15], and a recent Swedish study concluded that psychiatric ward design can reduce aggressive behaviour among occupants [16].

Biophilic design emphasizes the necessity of transferring the beneficial experience of nature to the built environment [7], [17]. The use of wood does to some extent mirror previous results from exposure to other natural elements, such as views and plants, cf. [18]. A seminal study was conducted by David Fell in Canada [19], he found lower stress reactivity in the autonomic nervous system for interiors with visual wood or green plants. Lower sympathetic activation and higher parasympathetic activation resulted in measurably lower heart rate, lower blood pressure, lower skin conductivity, and higher heart rate variability, cf. [10]. These results have been linked to exposure to wood. However, lower stress activation due to views and plants have also been shown to increase the ability to concentrate, lower pain perception, and speed recovery times. Though these benefits have not been identified for wood, they are tied to the same autonomic responses to nature seen with wood. Therefore, it is reasonable to expect that future research on wood will find many of these same results.

In healthcare environments, natural materials and views are associated with better patient outcomes with respect to recovery times, lower pain perception, and positive dispositions, cf. [9]. This alone can be a reason for including more wood in in these buildings.

This paper aims at providing an overview of a study that is planned carried out in and environment for psychological patients, an in-patient psychiatric ward. The paper outlines research hypotheses on wood use in healthcare environments, more specific in hospitals and psychiatric wards. The following research questions will be analysed:

1. Does the use of wood in patient rooms reduce the duration of the hospital stay?
2. How does the use of wood and visual wood surfaces affect patients and staff at the hospital?

Theory and Methods

Hartig defines restoration as a process of renewal that replenishes a depleted social, psychological or physical resource [14]. These resources have most often been depleted by an individual's effort to adapt to their environment. Early restoration theories focused on recovery from psychophysiological stress [15] and attention restoration [3]. Psychophysiological stress recovery theory posits that natural environments, and even views of these environments, will aid recovery from stressful events, including psychological stress and physical stress (e.g., recovery from surgery) [2], [4], [20].

Attention Restoration Theory (ART) focuses on understanding how individuals replenish their ability to exert attention on common tasks, such as those at the workplace that require directed attention [3], [20], [21], [22], [2], [24]. In an extensive review of the psychological benefits of indoor plants, Bringslimark et al. determined that although the evidence suggests indoor plants can provide psychological benefits [25], the heterogeneity amongst the methods and results may imply the benefits are contingent on the context of the encounter with indoor plants and the participants in the experiment. These concerns extend to experiments with wood or other natural materials indoors. Many studies have found empirical evidence to support these theories, but the theories themselves remain open to elaboration as more evidence is collected regarding the restorative effects of nature [20]. Studying the effects of wood on attention and psychophysiological stress restoration in the built environment may produce helpful and enlightening results.

In the case of both ART and psychophysiological stress recovery theory, the natural environment provides the individual with a means to restore themselves to a more complete state. These restorative environments exist in nature and provide a model for bringing the desired effects indoors. According to Kaplan [24], the components of a restorative environment are:

1. Being away - the sense of being in a different environment (distance is not a necessary component of being away.)
2. Fascination - when ones´ attention is effortlessly focused on something.
3. Extent - feeling an area to be large. Well-designed paths can be used to make a small area seem larger.
4. Compatibility - the natural affinity humans seem to have for nature makes it a compatible environment.

While many of the elements of restorative environments may seem challenging to incorporate into building design, biophilic design provides guidance on how to bring nature indoors therefore a means to produce restorative indoor environments. Biophilic design is the incorporation of the principles of biophilia into building design [7], [17]. These principles are built around the concept of an innate human attraction to life and life-like processes [17]. To create

restorative indoor environments with biophilic principles, Wilson suggests being away can be addressed with indoor gardens, views of nature, and other features occupants can view or visit, which differ from a typical workstation [26]. Similarly, design features may provide extent by varying ceiling height, including natural lighting, and other mechanisms [26]. Natural patterns, shapes, and forms all provide targets of fascination, while compatibility is derived from evolved human relationships with nature [17], [26].

The use of wood as a construction material, and how wood can be implemented in biophilic design is for example discussed by Salingaros and Masden [27]. They pointed out that wood is relevant both for structural and aesthetical purposes, but the design should be accommodated appropriately. There are six guiding principles of biophilic design [8], using wood as a natural construction material is relevant for at least four principles (1, 2, 3 and 5):

1. Environmental features - making design choices, which reflect readily recognizable as aspects of nature. These features may range from views of nature, to water features within the building, to including a wide variety of indoor plants.
2. Natural shapes and forms - using elements of the built environment to replicate naturally occurring elements (such as trees).
3. Natural patterns and processes - using elements of design (such as materials, spaces, lighting, etc.), which through visual recognition, touch, scent, or sound remind occupants of growth, life, natural motion, and other elements of nature.
4. Light and space - diversity of colour, natural light, and variability in lighting levels are reminiscent of nature. Further, difference in size and shape of spaces in the built environment also remind us of nature.
5. Place-based relationships - connections to cultural and ecological elements linking geographically distinct locations with the built environment.
6. Evolved human relationships with nature - the connections humans have developed throughout the evolutionary history. For example, natural settings, such as forests, have provided shelter and safety, food and materials for survival.

One way to implement biophilic design in contemporary buildings is the Restorative Environmental Design (RED) paradigm, which brings together the ideas of sustainable design and biophilic design [17].

Study at psychiatric ward

Most empirical studies addressing the psychological effects of wood-use have been conducted in laboratory settings. There is a need for studies conducted in real-life settings. In order to achieve this, an empirical study is planned in an in-patient psychiatric ward. The study will focus on evaluating how the use of a natural construction material in patient rooms can provide beneficial health outcomes, such as reduced duration of stay and reduced stress. Natural material will be compared to a generic interior design. The study is to some extent comparable to [2] study of the healing effects of window views in hospital settings.

The study is planned to take place in Södra Älvsborg Hospital, Borås, Sweden, and the study is conducted in cooperation with the hospital owner and the hospital architect. Södra Älvsborg Hospital is currently in the process of renovating and building designated for in-patient care. The buildings, which will gradually be finished until year 2021, are constructed at Södra Älvsborg Hospital in Borås, Sweden (cf. Figure 1). The project has a long history. Already in 2008, discussions began with the precondition to refurbish and extend the existing in-patient psychiatric care facility. This was proven disadvantageous, both functionally as in regards of facility managements costs. Therefore, it was decided to plan for a new building for the in-patient care. At the same time, discussions were put forward to connect in-patient and out-patient care in one building and, furthermore, to add the children- and adolescent psychiatry to the complex. Continuity and well-being for the patients as well as an effective use of the facilities spoke in favor for this joint solution. A, for the project, conceptually important decision was taken, meaning that the entrances for the children and adult psychiatry, as well as for the extensive out-patient care, were merged in a shared entrance hall. This works also as an entrance for the hospital's dining hall and conference facilities. To add, and underline, the public concept of the entrance hall the hospital's study and university areas for teachers and students are positioned here.

The new complex is shaped by three buildings. The out-patient care is positioned in the current in-patient building while the inpatient care for adults, children and adolescents are placed in a new star shaped building with four floors. Between the two, a one floor entrance hall building is positioned. Moreover, the in-patient care building houses the psychiatric emergency on the ground floor, the first and second floors contain the in-patient care for adult psychiatry, with a total of 72 beds, with two wards in each floor. At the upper, third floor, the children- and adolescent-psychiatry is positioned with out-patient care, daycare and eight in-patient care beds.

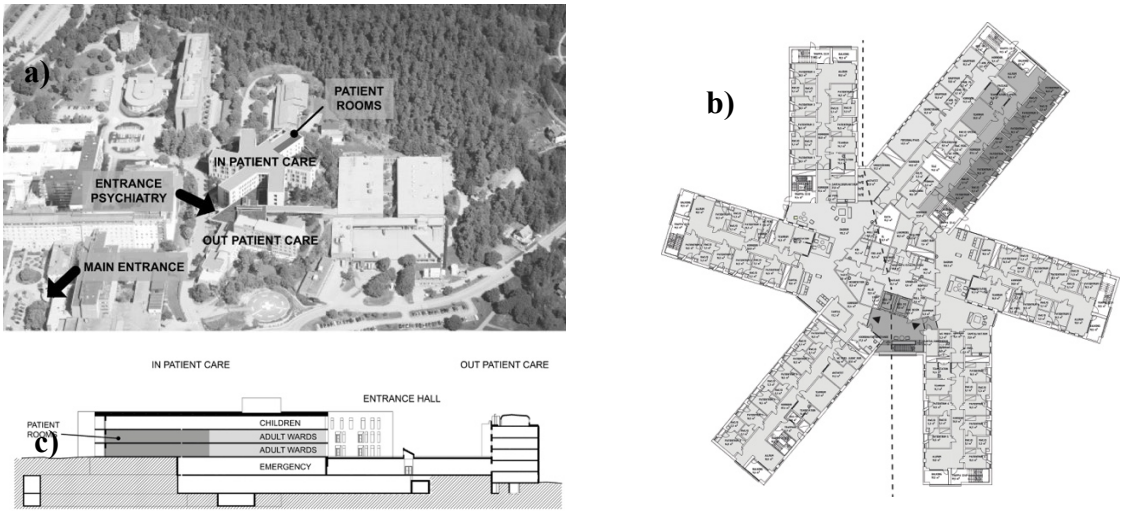

Figure 1. Overview of Södra Älvsborg Hospital, Borås, Sweden. a) Aerial overview, b) Plan of in-patient care building, c) Cross section of in-patient ward. Pictures: White arkitekter.

In-patient rooms

The six rooms for the planned study are positioned in a unit in one of the six arms of the adults' psychiatry in-patient care (Figure 2). The unit is one of the three units making up a ward, with in total 18 beds. The six single patient rooms, with en-suite bathroom, are all positioned at the south eastern façade. In addition, there is a joint dayroom with balcony within the unit. The staff areas consist of a glazed team station with a back-office and a team-room in the building's darker core. For the patient group there are also common dining- and living areas as well as activity rooms and other supportive functions. The idea with smaller patient groups, team stations and team rooms, is inherited from the successful somatic wards located in the existing so-called T-house at the hospital area.

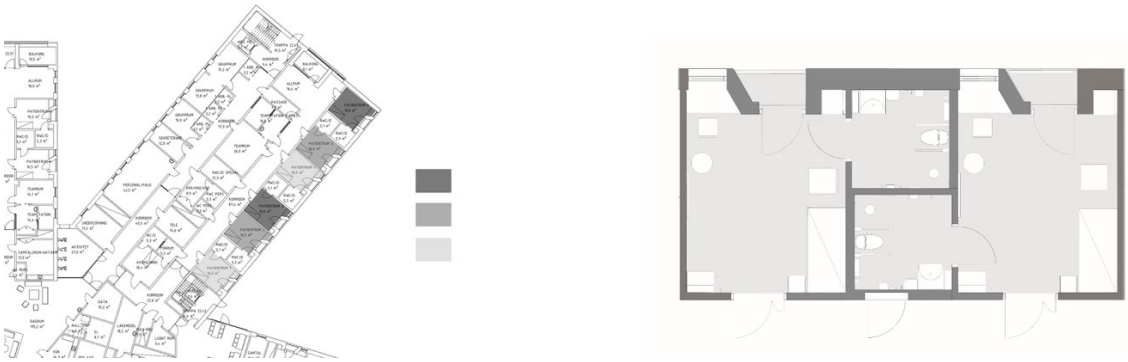

Figure 2. Plan of the ward that will be used in the study. Right: overview of ward. Left: Plan of two én-suite patient rooms. Pictures: White arkitekter.

Research design

The six rooms in the research study are divided in three types. The first one will have a slightly white-stained and lacquered birch plywood cladding on the façade wall (Figure 3). The second type will have the same wall cladded with a plastic laminate imitating birch plywood. In the third type of rooms, the wall will have a painted plasterboard in a light warm beige tone. The façade wall, in all rooms, have a door to a smaller, private balcony. The rooms are additionally furnished with a bed, an upholstered armchair with a lower table and a fixed writing desk with a chair. There is also a built-in wardrobe as well as a built-in locker and wash basin unit for staff. The walls are painted white, except for the wall towards the corridor which has a light grey colour.

Figure 3. Intervention room with wood. Picture: White arkitekter.

This study will be designed as a randomized, double-blinded experimental study. The intervention is the room with birch wood panelling, i.e., a typical patient room interior with wood on the surface of the façade-wall (Figure 3). Two types of control rooms will be fitted for the study furnished with (1) a generic material, painted plasterboard, on all four walls and (2) imitated wood panelling on façade-wall.

Participants will be recruited from the group of patients that are assigned to the psychiatric ward. Since the participants are hospitalized patients, it is of great importance that they are treated with respect and in accordance with current ethical standards. The study protocol and the informed consent procedures will be subject to approval by the Swedish Ethical Review Boards. In order to participate on the project, all participants must sign a written informed consent before moving into the rooms. Participants will be entitled to withdraw their consent at any time during the stay.

The patients will be assigned to a room upon arrival. Patients participating in the study will stay on the same ward and will be treated by the same personnel/hospital staff. Patients will be assigned to one of the three different room types. The orientation of the rooms used in the study will be similar for all rooms, and the rooms are all located on the same floor. Exposure time will be the duration of the stay of the patients and may vary between patients.

The study will utilize both quantitative and qualitative data. Data on patient´s health will be collected. In particular, the duration of the stay will be recorded in order to determine whether the material use influences the length of the hospital stay. In addition, interviews and questionnaires will be conducted. Through interviews and questionnaires, data on patients´ subjective evaluation of the in-patient rooms will be collected. Furthermore, the personnel working in the ward will complete questionnaires about the general state at the ward. Indoor climate will be surveyed through continuous measurements of indoor climate factors, such as temperature, relative humidity in indoor air, indoor air quality etc.

There are few studies that are relevant for a priori strength calculation. As a starting point for the calculation of strength and estimation of sample size, Ulrich's study from 1984 is used [2]. Ulrich's study comprised a total of 46 matched patients (23 pairs). All the patients had performed a gall bladder operation. Half had window views to nature (trees) (n = 23), while the other half (n = 23) had a view to a brick wall. The outcome measures were the number of days for admission, number and strength of analgesic drugs, number and strength of sedative drugs, minor complications such as persistent headaches and colds, and nurses' notes on patient condition.

There were statistically significant differences between the two groups in the number of days for admission (Wilcoxon matched-pairs signed-ranks analysis, T (17) = 35, z = 1,965, P = 0.025). The patients who had a view to the brick wall averaged 8.70 days in the hospital compared to 7.96 days for those who had a view to nature. The Wilcoxon matched-pairs signed-rank test is a non-parametric estimator and it does not specify either T-value or standard deviation that can be used to estimate the effect size based on these results [28].

There were also statistically significant differences between the groups with respect to the other outcome measures studied [2], but insufficient results (standard deviations and t-values) are reported to allow accurate calculation of power size. Ulrich's study had significant results with a relatively modest selection, but in order to minimize the possible effects of confounding factors, such as window view, and demographic factors, gender, age, ethnical background, the sample should be larger than for Ulrich´s study. For the current study data collection is therefore expected to last for two to three years

Discussion

The planning of the study will render if the study is possible. Great effort should be taken regarding choosing the right parameters for evaluating the research question. The group being subject to investigation consists of patients with severe health problems, and does not necessarily want to, or are able to, provide credible data on their own health. Objective outcomes will be collected, such as duration of stay. Information from patients will be collected by qualitative measures, such as interviews, in order gain an understanding of their perception of the interior and possible beneficial psychological effects. Furthermore, data will also be collected by staff in order to gain a continuous feedback on the patients.

The duration of the study will be fairly long, due to the fact that only six rooms are available for the study. Consequently, the data collection is expected to last for two to three years.

Different aspects of architectural design can influence users in all types of buildings, as described in previous research, e.g. [1], [29], [30], [31]. Thus, there can be various factors influencing patients´ health and psychological well-being, for example the window view in each room, the location of the hospital in an area with access to nature, general aspects related to architectural design or the fact that the ward is renovated/new. Furthermore, the amount of wood used in the interior (on the façade-wall) might not be sufficient to yield a significant on the patients.

Material choice can be an important measure to include in the design of health facilities. The study will provide new insights into what materials can be used and how they should be used to maximize possible beneficial health effects.

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