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Design Interventions in a Psychiatric Ward – Systems Theory Concepts in Design Practice

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Abstract

Concrete applications or methods for design approaches deriving from system theory are few and far between. This paper describes the development of a modular cocoon as a place of retreat for a Swiss psychiatric clinic. It is based on a participatory design research process that is substantiated by methods and concepts of system theory. The project aimed to answer to the question: What design interventions are appropriate to enable a retreat and individual shielding for psychologically traumatized patients and to reduce stress? On the theoretical level this project reflects on the extent to which systemic approaches can be translated into design practice.

The system theorist Dirk Baecker (2002) describes design as a practice that can inform different interfaces between systems of technology, body, psyche and communication (Baecker, 2002). He expands design's area of influence into pedagogy, therapy and medicine. According to Jonas (2004), design research is aimed at fitting artifacts to their surroundings (organic, psychic, social), at overcoming gaps and creating connections. A design intervention or an artifact can thus take on the function of an interface between various systems (psyche and body). In the project, after a phase of quantitative measurements in a ward for psychologically traumatized patients, qualitative interviews were held with therapists, nurses and patients. In addition, co-designs were performed with patients, such as working with a model. After data analysis of interviews and co-designs, light, colors and textiles were brought into a framework as basis for a prototype; it enabled each patient to design his or her own place of retreat. This prototype was designed in cooperation with the relevant stakeholders. This prototype of a *modular cocoon* seems successful. In a test phase in the ward, possibilities for interaction, variations of use and the modular cocoon's function are presently being studied. These patient tests demonstrate effects such as an increased sense of security and comfort as well as improved sleep quality.

Keywords: systems theory, self-organized-design in a psychiatric context, stress reduction, co-design

1. Introduction

This paper describes a research project in a psychiatric clinic in Switzerland: In a participatory process with caregivers, patients, doctors, therapists, and researchers the prototype of a *modular cocoon*, a place for patients to retreat into, was developed. This prototype was tested during several months in a ward for psychologically traumatized patients. The intention was to develop artifacts and/or environments for the reduction of elevated states of arousal and stress for traumatized patients. On a theoretical basis, we turned to concepts of systems theory and constructivism to support the explanation of the witnessed phenomena connected to applied research. Since the development of systems theory and constructivism is partially fragmented and contradictory, for the following context the theory is configured in a way that that renders it usable that it has value for applied research in health design. To explain and interpret the complex phenomena of stress and stress reduction related to the environment and to the prototype of the *modular cocoon*, we also refer to a bio-psychosocial model and to psycho-neuro-immunology.

Up to now design research has been more engaged in the development of theoretical reflections and frameworks of systems theory and constructivism (Jonas, 1996, 2004) than in applied research. There are a few practical applications because systems theory is mainly theoretically descriptive and rarely concrete or explicitly applied (see Symposia Relating Systems Thinking and Design 1, 2, 3, 4 in Oslo). We refer here to the sociological systems theory (Luhmann, 1984) and the constructivist approach of cybernetics (von Foerster, 1992, 1999).

Our research questions can be related to the applied level as well as to the theoretical level. The applied part of the project pursued the questions, what kind of design interventions, what sort of design parameters, and which constellations are suitable for reducing stress. It was asked, which design interventions are appropriate to create a place to retreat with the purpose to shield and protect psychologically traumatized patients, and how to reduce their stress. The theoretical part of the project investigates, whether a systems theory approach is able to produce evidence of stress reduction with traumatized patients, which other disciplines are not able to deliver.

2. Literature and definitions

2.1 Systems Theory

The systems theorist Dirk Baecker established a relationship close relation between of systems theory and design (Baecker, 2002), which again relates to Luhmann (1984). The former author Baecker describes design as a practice of ignorance (or not knowing), which can establish a wide variety of interfaces between systems such as technology, body, psyche, and communication. According to Luhmann (1984) a human being is divided into a living biological system consisting of the body with sub-systems such as organs, brain, nerve, hormonal, and immune system on the one hand, and a psychic system such as the awareness that operates through thoughts and feelings on the other (Luhmann, 1984). According to Jonas (2004) design research is aimed at fitting artifacts to the surroundings (organic, psychic, social), at overcoming gaps and creating connections. A design intervention or an artifact can thus take on the function of an interface between various systems, for example psyche and body.

Luhmann's system theory approach resonates in the medical sciences. The systems are operationally closed: one system can be the environment of another system, but there is no direct access between the two. The systems are not accessible to each other; for example, a thought is never part of a biological system but can have nevertheless strong effects on this biological system. According to Luhmann (1984) closed systems can be connected by

structural couplings (interfaces, bridging of gaps). The social system, representing for example the sub systems society, family, environment, and space is in turn connected to the biological and psychic systems of the people through structural couplings. Each system operates according to its own rules; however, sometimes perturbations can trigger reactions in another system.

The bio-psychosocial model (Egger, 2005), and psycho-neuroimmunology (Zänker, 1996, Schubert, 2011) also connect the systems of psyche, body and social (surroundings and environment). Later in this paper we will elaborate on the application of these concepts to design and design research, when referring to the project of a *modular cocoon*.

2.2 Constructivism and Participatory Design

From a systems theory and constructivist perspective reality is considered a result of a perception process in its own right. This process is due to separate conditions of the observer and the idiosyncratic forms of perception and not to a so-called objective reality. Accordingly, the respective reality of each singular patient is constituted by her or his personal observation and perception. Environmental stressors (light - dark, loud - quiet, cold - hot, etc.) are differently perceived, experienced and interpreted by everyone: therefore they have different effects. The same "stress dose" can trigger multiple responses in varying organs of different people. The effect depends on the current mental and physical condition of the patient. When transferring this knowledge to the design of hospital environments, it is to be expected that the same standardized patient rooms have different effects on the individual patient.

Based on this knowledge we derived collaborative approaches for the design practice, since different people of a system should formulate their own perceptions and experiences of an event to describe and explore this event in a multi-perspective way (von Foerster, 1992). Since the 1980s, this constructivist perspective brought new impetus to design and design research (Jonas, 1994), which distinguishes between different participatory approaches. Participatory design approaches often use this multi-perspective point of view for the development of prototypes. Ideally, prototypes will be co-created by potential users.

In the context of the project, we started off with a strong patient-centered approach in a specific patient group. In this patient group the ideas and wishes of the patients were within this group implemented in a prototype. At the suggestion of doctors and therapists, it was assumed that a maximum freedom of choice and control should be given to the patients of both the development and the subsequent use of the artifact (the *modular cocoon*).

2.3 The bio-psychosocial model and the psycho-neuroimmunology in the design context

To enable the classification of the various phenomena of interactions between patients and the prototype of the *modular cocoon* we have referred to explanatory models used in medicine. Design interventions can be described in their capacity as an interface as a sum of deliberately created environmental stimuli, which can affect the systems of psyche and body. The bio-psychosocial model from the fields of medicine (Egger, 2005) serves to describe the interdependency of the systems psyche, body and environment (social system) more accurately. Living systems do not just passively respond to environmental stimuli, but depending on the respective functioning of the systems, they constantly interpret their environment and generate significance (Schubert, 2011). According to their current status living systems actively interpret the environmental stimuli as stressors or non-stressors. Each fright, for example, triggers a hugely complex cascade (release of neurotransmitters, neuropeptides, hormones, etc.) in the organism. Each organism reacts differently depending on her or his condition and his previous experience. In this way it can be explained that the same fright or "stress dose" can raise a plurality of different reactions in different organs with

different people, because it depends on the state of perception and the physical and psychological condition of the individual (Zänker, 1996).

Not only the environment has impact on a system but also the system interacts and collects environmental phenomena, which are constructed by the system itself. The organ systems of an organism are in an ongoing dynamic adaptation to their physical and psychosocial environment and their activity is regulated by a variety of feedback mechanisms (Schubert, 2011).

Design parameters can, thus, cause feedbacks between the systems body and psyche. Any organism perceives differently; this is the main reason why the conditions of the framework of the prototype needed to be configured very flexible, so that it could be used in individual ways by the patients. Usually, designers give little attention to design parameters (environmental stimuli) in relation to their effects on biological and psychological systems. However, stress can only be dealt with, when understood as a biological response to environmental stimuli (here design parameters), which disrupt a finely tuned balance.

The assumption that design parameters are active components that can trigger relevant processes in the psychic and biological system demands that a very careful as well as precise conceptualizing and implementation of those design parameters will be dosed very precisely, when conceiving new products or environments.

2.4 Self-organization and self-organized design

To maintain or restore their mental balance traumatized patients need opportunities and offers responding to their higher state of arousal. A study shows that individual choices and a personalization of the environment have a positive significance for wellbeing and the reduction of stress and wellbeing (Ulrich et al., 2012). In a therapeutic sense a conversation, a stress-reducing drug, or as shown here, an individually designed shaped non-pharmacological design intervention, can provide opportunities for self-organization.

Self-organization in this paper is related to the respective individual use and appropriation of the prototype of the *modular cocoon* by the patients. The different design parameters were developed in a way that they allowed for a continuous design process of use for patients to achieve an effect of stress reduction. So in this context self-organization describes the momentum of systemic operations of the external influences of the environment (the technical and social system) on the systems of body and psyche. Ideally, the systems of body and psyche will be prevented from experiencing of stress development through the customizable external influences of the environment (here the *modular cocoon*).

The self-organized design also describes a further development of the concept of design-in-use (Bredies, 2014) with a different focus. During design-in-use the user determines how, where, and for what purpose artifacts are used: the use itself becomes the design. Also in the the concept of self-organized design the use itself becomes the design but in a specific context. First of all it is intended for the user context of mentally ill people in hospitals. It's primarily about the minimization of possible stressors during their stay in the clinic. By providing a customizable environment the patients feel less stress. Self-organized design describes here the dynamics of the systemic processes of effects of the environment on psyche and body.

3. Methods

As already described, the prototype modular cocoon was developed in a participatory process with the caregivers, patients, doctors and therapists of the psychiatric hospital, and the researchers, and tested from February until December 2014 in a patient's room of a ward for psychologically traumatized patients. The aim was to develop an artifact and environments for traumatized patients to reduce elevated states of arousal and stress.

The research process consisted of four phases:
Phase 1: Inspections, observations and measurements
Phase 2: Co-creations and co-designs
Phase 3: Data analysis and concept ideas
Phase 4: Implementation and test as an iterative process in the sense of continuous co-designs

Phase 1: Inspections, observation, and measurement
In the patient rooms observations and quantitative measurements (lux and decibels) were made before the interventions. They revealed poor lighting situations, bad acoustic conditions, and unpleasant odors as stressors.

Phase 2: Co-creations and co-designs
In a further step, interviews and discussions with relevant stakeholders using standardized questionnaires were carried out. Many of the stressors were confirmed and further ones such as insufficient retreats and lack of shielding were identified. In the interviews the stakeholders (patients, nurses, therapists and psychiatrists) were asked to formulate their own wishes, needs, ideas, and suggestions for the improvement of the patient rooms. Only patients collaborated in co-designs[1]. During the interviews, it became clear that psychologically traumatized patients have very precise ideas of what is good for them and what calms them. They often rebuild their rooms within a range of limited means and define the nature, texture, color and materiality certain items should have. Patients were very sensitive due to their needs for protection and individual shielding in dealing with what is good for them.

The following quotes illustrate the needs and wishes of patients.
P1: "The possibility to retire in a patient room is important (...) The shieling is very important."
P5: "To be able to be on my own and among others, it is crucial that both is possible. It belongs also to the healing process too".
P3: "How much shielding is needed, what is too much, so that one associates confinement and uncertainty. The control must be guaranted."
P4: "If something is closed, that´s a stressful moment. The environment must give safeness, the room must be the safest place."

They were able to accurately describe on a verbal level, why special items have positive or negative effects on them, why they feel safe, or what should be changed, to make them that they feel safe. The realization of participatory design with a co-design approach with psychiatric patients is time consuming and cannot be performed with conventional methods such as workshops. Patients in an acute phase of the disease are not able to collaborate with many stakeholders like psychiatrists, nursing staff or therapists in a room over a period of time. For this reason we have carried out individual sessions: each patients got a simple box. To offer a low-threshold setting for the co-design, the cardboard box was filled with a playmobil hospital bed, small objects, colored papers, and material samples. The objects and materials for model making intentionally had an improvised character to foster the desire to touch them and try them out, so the patients were enabled to work on their own emotional understanding (Figure 1). Each patient had one week to work with the box and could work independently of fixed dates.

Figure 1: The co-design on the left hand side shows living and sleeping conditions separated by transparent textile. The co-design of the right hand side shows a sleeping place with a wooden halfpipe above bedding and an oversized lion poster.

Phase 3: Data analysis and concept ideas

The analysis of the models and the transcription of the interviews and subsequent analysis interpretation of all data were merged. Criteria derived from this data and were transferred into concept ideas. These concept ideas were presented in workshops and discussed with stakeholders due to the above conditions - without patients - and evaluated. Based on the assumption that specific design parameters cause certain effects, the design parameters light and colors, textiles and wood were selected for the prototype. These specific design parameters were derived from identified user needs and desires. Wood was selected as material and associated with security and as well as protection, by almost 100% of the co-designers and co-creators involved. All patients and some nurses mentioned textiles as a material for shielding and retreat.

The existing light situation on the ward was identified by patients and by nurses as stressors. Patients and nurses desired better light, but probably due to its invisible complex causal relationships and its immateriality in the co-designs the lighting was hardly not edited. The researchers introduced the results already known for the psychiatric context from the discipline of chronobiology (Wirtz-Justice, 2010) regarding for the significance of natural and artificial lighting.

From ideas of the doctors and nurses proposed to give patients as much room in the design of their environment as possible, so a user framework has been designed, which allows each patient individually to create his own light and the light colors e.g. brightness up to 2500 lux, RGB colors via tablet (Figure 3). In order to create their own retreat and protection zone the patients can use several layers of textiles in the patient room.

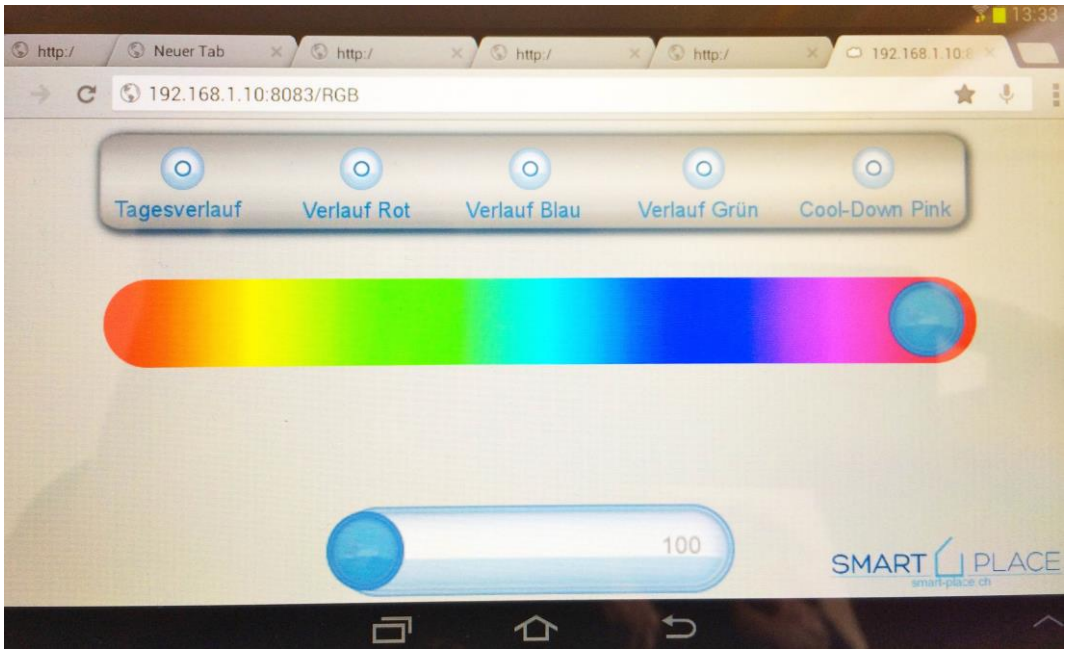

Figure 2: The tablet allows the control of biologically effective light on the one and on the other hand individual atmospheric color settings can be made.

Phase 4: Implementation and test as an iterative process
The testing of the *modular cocoon* in the patient room were was used to evaluate various aspects: the interactions of patients with the *modular cocoon* on the one hand and the individual design parameters light, colored light, textile layers and wood element on the other. They were evaluated through interviews and questionnaires. Of interest were factors, such as: what exactly happened here, during the use of the modular cocoon. Which components were used by the patients at what time and in which emotional state? The nurses and therapists observed and finally evaluated the effects on the agitation and stress symptoms. The care manager was very helpful in parts for this evaluation. She gave a questionnaire every two weeks to the patients. The questionnaire was developed and evaluated by the researchers.

4. Findings

The research results refer to two levels:
1. The results and effects of the systemically applied research project. The research objective was to develop stress reducing environments in a co-design process were that involved traumatized patients and other stakeholders of a psychiatric ward.
2. On the integration of systems theory and constructivism in design research, resulting in and the practical implementation of this theoretical approaches in an applied research project in a psychiatric hospital.
Ad1: An essential feature of the described design process was the continuous change of the prototype by the patients themselves, which came about through their processes of appropriation. The patients adjusted the prototype as long of their needs, until the effect of the stress reduction actually took place. This continuous appropriation corresponds to a self-organized design process, which is performed by the patients themselves (Figure 4 and 5). Patients reported among other effects on a calming atmosphere, a feeling to be better protected, a more quiet and improved sleep, an increased ability of imagination, less medicines a better re-orientation after nightmares, etc.

Figure 3: The two photos show the individual settings of the *modular* cocoon from the first patient of the test.

The following quote describes abbreviated and in extracts the experiences and effects, which this patient had with the *modular cocoon*:
"I've tried different lights. Mostly in the early evening I have always set a kind of sunset. Later that evening I have felt that the cool down pink reassures me. I have switched on the TV and the pink light. And my sleep has improved a lot. After nightmares, I had the feeling that my orientation came back faster. I used both curtains. It had good protection for me. I have found out that the protection is best, when the pink light is on and both curtains are closed. And so I knew that I am protected also in the morning, when nursing stuff comes in and couldn´t see my self immediately."

Ad 2: The approach derived from the mentioned theories has emerged as well transfer on the design research process and the design process. This appeared particularly in dealing with the prototype. Patients used the customizable elements of the *modular cocoon* (light and textiles) depending on their condition and the time of day very actively and highly different. Also during their stay in the clinic we observed changing usage patterns of individual patients, too. According to literature on participation, the design process stops after a certain number of iterations. However in the process described in this paper the activity of the feedback mechanisms of systems persists and similarly the self-organized design process of patients in the use of the *modular cocoon* continuous. This becomes obvious especially in the light of regarding the goal of reducing stress with respect to the bio-psychosocial model.

5. Discussion and Conclusion

The concept of self-organized design allows patients the control, for example of light and enables themselves to find individual atmospheric lighting moods, which calm and regulate their stress levels. The external self-organization of the design parameters correlates with an auto-regulation of an inner stress level. The bio-psychosocial model from the field of medicine (Egger, 2005) serves to describe this correlation.

In this sense, the research project complements the participatory approach not only in a wider sense of a participatory design process (participatory design of artifacts), but to the continuous self-organized design of an artifact in use whose design is dynamic and is dependent on the respective user.

From the perspective of understanding health and wellbeing the prototype with its three components of light, colored light, wood and textiles represents a sort of 'environmental catalyst', that promotes the patients activity and conditionally depending on this activity also

their auto-regulation of patients emotions like stress and anxiety. From a systems theory and constructivist perspective an artifact has to be flexible and dynamic in order to generate wellbeing and stress reduction, because each patient perceives her or his environment depending on the disease, medication, and current state differently. Accordingly, each patient has individual needs in the regulation of light, air, temperature, acoustic pollution, odor and other parameters. This patient-centered approach still represents a functionalist approach although it contrasts strongly the currently standardized egalitarian hotel room facilities of hospitals and clinics.

The above project shows only a brief insight into the ways in which a patient can create customizable rooms. In this context there are no limits to the implementation of digital media in a social and innovative way. Regardless of the current trend moving to the single hospital room the patient room of the future should offer a variety of choices, which allow each patient the creation of his or her environment. The possibility of interventions creates new opportunities to enable patients activity and thus wellbeing and in the consequence stress reduction.

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