Ocean and Sea - design with chromatic smart materials

Textile dividers for a changeable environment for the patient

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Ocean and Sea, is a conceptual solution for knitted textile dividers that aims to create a changing element in the patient’s environment (for example the treatment rooms). The knitted screens are for windows in patient and treatment rooms, dividing out-door from in-door. The purpose with the concept is countering the view from the street or from rooms in other buildings so the patient will feel more secure. The seconded aspect that the textile divider is aiming to improve is the situation of a static environment for the patient. During the day and night, with the use of chromatic smart material, the textile changes from white to a colour, to glowing in the dark. The design has different expressions due to the different tints of the colour, depending on the amount of sun on the window, giving the design an interacting variable parameter.

Marie Ledendal has been working with textiles and the health care environment at the Swedish School of Textiles since 2005. At present Marie is working with conceptual applications with chromatic materials and interactive textiles for the health care interior.

Photo 1; Sea, Fluorescent yarns, the textile "glows in the dark", Photographer: Jan Berg.

Photo 2; Ocean Photo chromic yarns, the textiles goes from white to either purple or aqua, Photographer: Jan Berg.

1 Divider means a textile with purpose to mark off an area, a volume of space, in the hospital. The textile can divide the inside from the outside, a treatment room from a hall or a bigger room into smaller areas.
Ocean and Sea are complementing each other and are thought to work together in the same room or window. The textiles can be layered in front of each other with a half drop. The design is first and foremost made in relation to the colour aspect, wanting to add more colours to the hospital environment. The colours blue, turquoise, purple, orange and yellow are chosen with the studied colour psychology as a starting point. The intention is that the rooms should, by the blue and turquoise, get a cooling feeling and through the orange and the yellow a warmer one. The idea with the amount of colours that varies over the day in relation to how the weather is outside is that the patient will get a subtle connection to the outside. The colours should also be chosen so that they will work for several years to get a more aesthetically sustainable product. Therefore more extreme trendy colours and colour combinations have not been used. By being silicone coated the aesthetic expression gets a more interesting tactile and visual expression. The surface has a glossiness that gives an impression that the textile is clean. It also adds a glittering effect when the light waves are spread through the rubber. By enclosing the knitted textile in the silicone the divider will be washable in 60-80°C and easy to wipe off, parameters that are important for the chosen hospital environment. The silicone will most likely also make the textile flame retardant due to the fact of the stability of the silicone; this has to be tested before the extent of the protection can be certified.

Photo 3 A-C; Visualisation of the changing atmosphere in the treatment room, A: 8.00 in the morning, white panels B: 12.00 in the day, green panels and C: 23.00 in the night “glow in the dark” panels. Visualisation pictures: Marie Ledendal.
The healing environment

There is an ongoing overall structural change in hospitals in among Sweden, which affects both the logistic of running the organisation as well as the design of the building, wards and the environment. The textile divider will in first hand be intended for these hospitals that have a patient-centred ideology and structure. The ongoing debate also has a focus on the significance that the environment has on the patient’s wellbeing and recovery. The same discussion can be found in areas regarding the light and colour and shape as well as the sound. The overall discussion refers to the term “healing environment”. How we as patients are being affected by our surrounding and how that will have spin-off effects on our recovery when staying at the hospitals. In my view, this debate is essential for the progress in getting a more healthy hospital environment.

"... when you’re in a healing environment, you know it; no analysis is required... Healing environment allow the patient to mobilize inner resources from the body, mind, and spirit that help them to respond and adapt to their own illness... does not harm the patient with toxic materials, lighting, noise, or temperatures."

(Stichler 2001, p.2f)

Different researchers state that certain colours can reduce anxiety and that nature-motifs easier catch our attention than abstract ones. Thoughts that can be found in for example Jean Watsons theory (from the 1970th) about how the aesthetic expression is of significance for the healing process, where colours and shape, through art and music, can be a working tool (Watson 1979, see Wikström 2003, p.40). In another example B.-M. Wikström; points out that it is important for the healing process how the architecture is designed, because the architecture can also have a negative affect, such as stress and other physical symptoms. By creating a harmonic and well balanced environment the effect can be the opposite. (Wikström 2003, p.60) This is an aspect that D. Edvardsson touches in his dissertation. The patient is affected by the surroundings; of how the patient experiences the hospital environment and the hospital stay. (Edvardsson 2005, p.7f)

Several spokesmen for the Healing Environment mean that for example the sound environment is important. For more information see chapter 6 in the technical report Sound absorbing textiles for hospitals- a framework for requirement specifications.
The Concept

An existing problem that patients can have to deal with is the view from the street and near situated buildings into the treatment rooms. If I would put myself in a patient’s situation, a feeling of security is of importance. To have to undress in front of strangers makes many uneasy, which you often have to do in front of the doctor or nurse. To have to worry that somebody from the street or the next building might see you is adding extra stress to the situation. When being sick you might not want to be stared at and it can be nice to be able to pull down the curtains. By visually being assured that I can not be seen the problem will probably soon be cleared away. It is however important to still be able to get in the sunlight, which makes blinds a bad suggestion. Also to think about that blocking the view might not always be needed.

Photo 6 A-C; A: Sketch of the changeability effect with Fluorescent yarn “glows in the dark” and B-C: the Photo-chromic yarn. Photographer: Marie Ledendal.
By using the method functional analysis, the most important factors of the knitted divider was the changeability in the expression. The idea to let the colour be the changing factor was thought of early in the process. Colour boards were made with reference to colour physiology, but the decisions of the actual tints were also made through the aesthetic impact the chosen colour would have on the room. The final colour range has blue, turquoise, purple, orange and yellow tints. The green-blue/turquoise is recommended as suitable for treatments rooms, because of its relaxing and cooling effects and Alfa and Delta rhythms indicates that blue is more soothing than red (Gimbel, 1994, p.28-29) (Küller, 1995, p.22-24). The yellow and orange tints were chosen to create a warmer environment. The purple is a colour that the Anthroposophist use in treatment rooms (van Luik, 2007.02.03). The colours are also chosen on the premises that they can work for several years without becoming untrendy, something that for example Södra Älvsborgs Sjukhus has stated in there policy as important (SÄS 2003 p.2).

A Functional Analysis is a method for pinpointing the different aspects the product has to discuss and solve. By ranking the functions Head Function HF, Necessarily N, Desirable D and Undesirable UD the different aspects can be prioritized in the right order.

Alfa rhythm indicates that a person is relaxed (Küller, 1995, p.24)

Delta rhythm distinguishes sleep. (Küller, 1995, p.24)
The effect of colour changeability was reached by the use of colour changing smart materials. Chromic materials are materials that react to outside stimuli and thereby change their appearance. There are a number of chromatic materials on the market today, such as Photo-chromic (reacts on light), Thermo-chromic (reacts on heat), Electro-chromic (reacts on electrical), Piezoro-chromic (reacts on pressure), Solvate-chromic (reacts on liquid) and Carsol-chromic (reacts on electronic beam). (Berzina, 2004, p.143) Tests with thermo-chromic ink were made. By using both normal pigment as well as the thermo-chromic it is possible to go from one colour to another. To get the change the fabric has to be exposed to a heat source (such as electricity, heat elements or body warmth). In this case the knitted window screens could consist of a conductive yarn, which is connected to a current. The second chromatic material that was tested was ultraviolet light reactive material, Photo-chromic. The tests where done with a Reversible 6 Photo-chromic effect. (www.colorchange.com) A Glow-in-the-dark ink was printed on an Ink-jet transfer printed sample, to test the idea with a change of the environment between daytime and the evening. This could be a positive solution in countries at latitudes like Sweden because of the long dark hours in winter time. The Photo-chromic absorbs the UV-light during the exposing time, when turning dark the colour then glows with a yellowish light. (www.colorchange.com) 8:00 a clock in the mornings and the textiles are still white. It was quite fun the other day when I suddenly realized that the textiles actually change colour during the day.

A Scenario in a room in the new building at the hospital "I'm in the hospital after surgery. I have been in this room for a few days now. It is starting to feel like I know the routines. The nurses checks in on me every now and then, and the doctors do the round in the morning. It is nice to be able to look out the windows when I want to, but it feels secure that the nurses pulls the curtain in front of the window, before they examine me, especially since my room is on the ground floor.

Yesterday the sun was shining straight in to the room and they really turned blue. And in the evening when it was more cloudy outside the blue colour was less bright. I know it isn't much but it's nice to have something to occupy the mind with, when laying here. Even if it is just finding out how the weather affects the colour on the curtain, at least it is something else than constantly thinking about the operation and my recovery.

22:00 it's dark outside and it feels quite cozy with the light glowing from the curtains in the window. It is soothing in a way."

References

Books


Articles and Reportages


Internet


The Institute for Complementary Medicine (ICM) is a UK (homepage), "Obituary - Theophilus Gimbel (1920-2004)."

Pictures

Pic. 1-2 Photographer Jan Berg, Textile Museum in Borås, 07-12-18

Pic. 3-7 Photographer Marie Ledendal.

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6) Thermo-chromic ink is an ink that at a specific temperature gets transparent or changes from one colour to another (different ink effects at different temperatures -SCD, 2007). (Color Change Corporation, 2007). There are both Irreversible (does not change back the colour after the UV-light source are removed) and Reversible (change back the colour after the UV-light source are removed) Photo-chromic materials on the market. (Color Change Corporation, 2007).