

Crafting atmospheres for Healthcare Design

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Abstract: *This work contributes to the growing body of work, conducted on the vicinities between well-being and biomedical treatments in health design. The article presents and discusses the design of the new delivery rooms at a Danish hospital in Hjørring, including the multi-sensory artwork: Nordjyske stemninger (Moods of Northern Jutland). The authors are both artists, architects, and researchers in this project, thus it is not the purpose of his article to report evaluation results. However, it is our intention to share and discuss contemporary healthcare design strategies and point to the importance of considering the interplay between cultural, social change, and environment in order to bridge the know-do gap in healing architecture. Based on our work we give a concrete example of a case aimed at re-introducing art in healthcare environments, supporting the caregiver, the laboring mother, and her companion in the existential and life-changing moment. The article includes descriptions of the design process including interviews, observations, and reflections. In this case, we want to argue that the gap between visions and implementation in evidence-based design and healing architecture, must be understood as a symptom of a deeper epistemological and philosophical challenge concerning the dichotomous and demarcating understanding of the relation between the human and its surroundings, obstructing ecological coherence and validity and silo stacking of results not utilizing the rich potentiality of interdisciplinarity synergies. As it is difficult to convey a bodily and sensory experience in only words and images, we hope that the reader will use their imagination while reading the descriptions of a situated experience throughout the article. The Ukrainian sculptor Alexander Archipenko described the cause and impulse of creative motivation as seeing the absence of a thing. With this lens we invite the reader behind the scenes in the creation of somesthetic design of the new delivery rooms, now being the background of more than 1.000 births a year in the Northern part of Jutland. The argument of this article uses artistic practice to explore a new potential healthcare practice, with overseen and neglected potentialities in a supportive somesthetic healthcare design. The article is structured in four parts: Healing environments, Somesthetic design framework, The sensory delivery room, and Reflection.*

"It is not exactly the presence of a thing but rather the absence of it that becomes the cause, and impulse for creative motivation" Alexander Archipenko, (Nichols 2003).

1. Introduction

This work contributes to the growing body of work conducted in the vicinities between well-being and biomedical treatments in healthcare design. The article presents and discusses the design of the new delivery rooms at a Danish hospital in Hjørring, including the multi-sensory artwork: *Nordjyske stemninger (Moods of Northern Jutland)*. The authors are both parents, artists, architects, and researchers in this project, and it is not the purpose of the article to report evaluation results. However, it is our intention to share and discuss contemporary healthcare design strategies, and point to the importance of considering the interplay between cultural, social change, and environment in healing architecture. Based on our work we give a concrete example of a case aimed at re-introducing art in healthcare environments, supporting the caregiver, the laboring mother, and birth companion in the existential and life changing moment.

The article includes descriptions of the design-process including interviews, observations, and reflections. As it is difficult to convey a bodily and sensory experience in only words and images, we hope that the readers will use their imagination while reading the descriptions of a situated experience throughout the article. The Ukrainian sculptor Alexander Archipenko described the cause and impulse of creative motivation as seeing the absence of a thing. With this lens, we invite the reader behind the scenes in the creation of the somaesthetic design of the new delivery rooms, now being the background to more than 1,000 births a year in the northern part of Jutland, Denmark.

This article's main contribution is to explore how a somaesthetic approach to healthcare design opens a series of ethical perspectives and ideas useful in creating healing healthcare atmospheres. The existing clinical paradigm is known and accepted as a “normal” and “neutral” interior space, where there is a dominant focus on functionality, security, and efficiency. However, seen from a somaesthetic perspective, no space is neutral, and traditional healthcare aesthetics have rendered an inhumane environment for people to experience their most private, extreme, and valuable moments – during the birth of their child. One can argue that the brutal lack of sensitivity to the sensing body and its context is a lack of care. Most often the birth ends with a happy moment, however babies are also stillborn, which renders another set of emotional needs. These two birth situations are radically different, even though the bio-mechanical process is similar. In this experiment, the team has been focused on the healthy birth; however, further research is currently being conducted into stillborn cases in somaesthetic delivery rooms by the authors. Designing for life and death demands a highly skilled, collaborating design team that includes users and expertise from many domains (midwives, doctors, nurses, architects, composers, cinematographers, painters, software engineers, etc.). All technical solutions must be extensively tested and known in depth by the team. The artistic expressions must be developed to support the healthcare personnel's act of care, and address the patients' deep emotional needs, and use state-of-the-art research as a foundation for their work. Somaesthetic healthcare design is serious design that will shape the most important memories, and the art will help people in their most vulnerable moments when they experience the life or death of a baby.

2. Healthcare setting



Figure 1 Delivery room in Hjørring before the artistic intervention, Spring 2020

In Spring 2020, the North Denmark Regional Hospital in Hjørring, Denmark, opened their four new delivery rooms (37 sqm), as seen on images above. The design of the rooms was based on knowledge from *healing architecture* (HA), e.g., using large windows for optimized daylight, ideally an outlook to green areas, intelligent lighting systems to support the circadian rhythms, and wellbeing of patients and staff. However, the complex building process hindered an outlook to green areas, and the idea of large windows clashed with the need for privacy and intimacy in the birth situation. The vision of homelike décor was reduced to a chair for the patients.

In Spring 2021, fieldwork was conducted by the authors to follow a couple's birth from beginning to end. The focus was to understand the effect of the delivery room as a birthing and working environment, including a soundscape analysis. This fieldwork analysis informed the design decisions, and allowed the team to establish a mutual understating of social, functional, and emotional needs during a labor process. This analysis includes phenomenological, as well as procedural and empirical demands, such as: during a caesarean section, 18 specialists need to have access to the mother and all equipment, and everything needs to comply with clinical cleaning regulations, etc. The functional needs are well known by the healthcare staff and extensively described; however, the element of emotional and social needs is lacking, which motivates the following phenomenological analysis.

The environment in the delivery room was dominated by functional and institutionalized things and sounds, such as air conditioning, clock ticking, sounds from different hospital equipment and alarms, noises from furniture in other rooms being moved, doors slamming,

footsteps, tapping on the computer keyboard used by the midwife, ambulances outside, and alarm sounds from equipment in the room. A sound system in the room for personal music choice was used for a short period in the beginning of the birth. The only non-functional sounds were conversations between people in the room. There was an overall lack of background sounds, and on the muted background functional and signal sounds stood out, taking foreground attention.

The room was divided in four zones: entrance, bath, birth, and toilet. The entrance was placed next to a sliding door to a toilet, a coat rack, and four cabinets for staff use. A $\frac{3}{4}$ hospital bed divides the delivery room into a bath and birth zone. In the bath zone there was a bath top, chair, table lamp, height adjustable computer workstation, phone, stainless-steel rolling table, rolling bin, sink, mirror, and plastic glove dispensers. In the birth zone, there was a birthing bed, radiant warmer, suction machine, CTG, oxygen, nitrous oxide, aspirator, whiteboard, and lots of visible technical pipes and infrastructure. The walls were covered in white glazed tiles, off-white paint, and one wall was painted with a matching color to the petroleum-colored linoleum floor. A reflective, framed poster with breastfeeding training information, laminated lists with phone numbers, handwashing techniques, and waste-handling guides decorated the walls. From the ceiling were a red emergency line, ventilation, a surgery lamp, dimmable ceiling light, smart blind system, and integrated loudspeakers.

The overall experience of the room is that it seems dull and muted with an absence of sensory stimulation. After some hours, a slight sensation of pressure on the ears as if listening under water. During the whole birth process there are no natural sounds entering from the outside, and thus no sensation of having a connection to circadian rhythms and weather changes. The window shutters are closed, so there is almost no natural light to indicate time of day, and from the ceiling a homogeneous office-like lighting secures good institutional working light. The ticking of the watch often takes the foreground of attention, also for the couple giving birth. The slamming of the door. A feeling of a 'presence of absence', and a sense of losing track of time and place – it is like being guests in a machine room. (Field notes taken during a delivery)

Overall, our analysis of the birthing environment points to the everyday difficulty of applying generalized guidelines of HA in practice. The delivery rooms are dressed up as spaces ready for emergency, and the white hospital rooms still risk becoming yet another non-place (Augé, 1992). The rooms did not offer people a space that empowers their identity, and did not build a rich, common reference of a group of people. Finally, these non-places were not popular places to live or work, rendering people as anonymous patients or white-coats. Emergency has become everyday life in the hospitals, and the sensing body has been forgotten despite the holistic visions behind HA (Folmer, Mullins, & Frandsen, 2012; Ulrich, 1984).

Based on the extensive review of art and culture's effect on health and well-being by Fancourt and Finn (2019), and practical design knowledge from previous experiments in sensory delivery rooms in Herning, described by Lorentzen, Andersen, et al. (2021), the design team was invited as leading designers in the design of the four new sensory delivery rooms. The team consisted of an interdisciplinary group of experts, including architect and researcher Esben Bala Skouboe (author), nature photographer Morten Hilmer, composer and sound studies researcher Marie Højlund (author), painter Henrik Godsk, chief midwife Helle Høy, and doctors Anya Eidhammer and Lars Burmeister.

3. Healing Architecture, and Sensory Delivery Rooms

To frame the creative process, and transform the new birthing environment into sensory delivery rooms that resonate with the visions behind HA, the article dives into the status of HA, and research on birth environments. Based on this analysis, it is argued that there is a need to break with the reductionist idea of expert knowledge and generalized design practice, and facilitate a holistic approach to both the environment and the body adopting a somaesthetic approach. This shift calls for a deeper epistemological and methodological reflection, before moving on to the concrete design transformation.

During the last century, there has been a movement towards HA that focusses on how hospitals may accommodate healing environments to maintain personal integrity. The American professor Roger Ulrich led one of the first systematic studies in evidence-based healthcare design (Ulrich, 1984). The experiment demonstrated how the architecture and its surroundings could affect the recovery of patients, and help lower the workload on personnel. This study is one of the first examples of evidence-based healthcare design, and has shaped a new holistic and stimulating approach to hospital design, emphasized by Dirckinck-Holmfeld & Heslet (2007) and the extensive literature review *Healing Architecture* (Folmer, Mullins, & Frandsen, 2012, p.4; Frandsen et al., 2009).

The review became a dominant reference for legitimizing HA as the guiding concept used in the design of new Danish hospitals. HA focuses on how new hospitals can be built with the patient's experience of the environment in focus, and at the same time aim at improving the overall experience of staff and visiting relatives. This expands the holistic and integrative vision, and goes beyond traditional act of building, because it addresses the healing agency of space, which had for long been subjected to a mechanical and efficient ideology. HA architectural design was to be supportive and promote wellness, and healthcare environments should be designed to foster patients, personnel, and relatives coping with stress, by building spaces that stimulate a sense of control with respect to both physical and social surroundings. Essential to the concept is a deep connection to deeper qualities in nature, further elaborated by Browning and Ryan in *The Biophilic Design Guide Nature Inside* (Browning and Ryan, 2020).

Giving the patient access to social support from family and friends has been found to be an important factor to reduce the experience of stress in the environment. Lastly, HA describes the use of integrated art as a potential tool for positive distractions (Ulrich, 1991). The concept of positive distractions is defined as, “an environmental feature that elicits positive feelings and holds attention without taxing or stressing the individual, thereby blocking worrisome thoughts”. Positive distractions come in many forms, including visual images, songs, music, animals, digital media, etc. The distractions re-establish a link between music, art, ornamentations, architecture, and the sensing body. The need for the positive distraction must be context specific, e.g., in the case of the last phase of birth, a wave on the local beach with periodic rhythms would help the woman giving birth to steer her breathing patterns and help pain management. Positive distraction can also involve building ornamentation (Sussman & Hollander, 2021) and decorative detailing, which will attract attention more than a blank wall.

Overall, the paradigm of HA envisions a future hospital where the interplay between the experiences of the sensory, competent human and the environment takes the center of attention. A healing environment is characterized by meeting the need to feel both protected and secure in a hectic healthcare environment, and like an integrated part of this environment, empowering the patient to be able to actively choose privacy or to engage in the environment at different

times. The environments become an instrument that support clinical as well as social activities.

Research in healthcare design of birthing environments emphasize at least three primary knowledge fields: a good and healthy treatment (surgeon), a strong and good nursing relationship between people (nurse), and a well-tuned space for recreation (sensed space). The interplay between these domains is experienced by the patients and their relatives on the sensed journey through the hospitals. During the last decade, extensive research has been conducted in the field of good treatment, causing major improvement across the sector. In the case of treatment, the birth mortality rate fell from 27,711 deaths per 1,000 live births in 1953 to 2.5 deaths per 1,000 live births in 2020 in Denmark (United Nations - World Population Prospects). This impressive result is a result of a systematic collaboration between nurses and doctors, which is not to be neglected. The design of the birthplace has been associated with health outcomes, including the number of caesarean sections, maternal pain ratings, satisfaction with care, and the ability of staff to perform their duties (Setola et al., 2019). In the study, Goldkuhl et al. (in press, 2022) engaged in ethnographic fieldwork to explore the influence and meaning of the environment in regular birthing as well as in sensory-birthing rooms (with new furniture, natural-colored fabrics, lighting, and nature scenes projected on the walls, combined with nature sounds, which reminded some of the women of their home or of previous experiences).

The study showed that the *regular institutional* room was dominated by an institutional décor and birth philosophy, causing the women to adapt to the role of the passive hospital patient, asking for permission to change body position and difficulty in initiating their own activities. In contrast, three parameters related to the sensory-birthing room helped enabling an experience of a *personal room*, signified by the birthing women's active involvement and agency (self-determination and ownership over the room, process, embodied knowledge, and informed decisions):

- 1) Sensory-birthing room shaping the whole experience positively by giving the woman a welcoming feeling, symbolizing tenderness and care in the otherwise unfamiliar hospital atmosphere, reminding some of women of their home or previous experiences. The rooms furthermore enabled the women's adaptability, spatial mobility, and feelings of familiarity by providing possibilities of modifying the room, taking initiative, and showing ownership over the room; agency was enabled when they experienced a sense of control over the room.
- 2) The care-provider experienced an ability to put the standardized institutional birth manual in the background, and foreground "an approach and care that conveyed a calm, equal, and trusting atmosphere" (Goldkuhl et al., 2022, p.7). The care enables the women's feeling of agency, and their intuitive bodily sensations were allowed to guide the birth.
- 3) Devoted involvement of an active and supportive birth companion, initiated by the care-provider's invitation for them to take part and find their place in the welcoming room.

Based on this review, and the descriptions from leading midwives and doctors on the team, it is concluded that an optimal birth environment involves not only meeting the needs for medico-technical safety, but also ensuring a physiologically and emotionally *safe space* or *birth territory*, signified by a permissive atmosphere where birthing women have a sense of agency, safety, and satisfaction - contributing to a sense of familiarity and calmness. In other words, it is

not enough to design a calming setting if the overall hospital birth culture with its institutional authority permeates the atmosphere (ibid., p.8).

The *birth territory theory*, described by Fahy and Parratt (2006), outlines that a less familiar environment makes labor feel fearful and uncertain. Therefore, there is a need to support a birth territory as a *sanctum* similar to the *personal room* in being “a homely environment designed to optimize the privacy, ease, and comfort of the woman”, and enhance the “embodied sense of self” and agency (ibid., p.46). Downe et al. (2018) reported women's positive childbirth experience, apart from having a healthy baby, also included giving birth in a safe environment.

Anthropologist Birgitte Folmann did a phenomenological study about the father's role during birth in a comparative study of a standard and a sensory delivery room at Regional Hospital Herning (see image). The study showed how the sensory delivery room offered the birth companions with possibilities to engage in practices of attunement, resulting in a more explorative and active role during birth. Furthermore, they described their sensory experiences in a more nuanced way afterwards, when remembering the experiences. “Since action can modify perceptions, the fathers' more active participation in the birth ended up changing the way they perceived their experiences” (Folman, 2020, p.129) as they felt they could easily adjust and remain calm in the process of attunement. Designing multi-sensorial birth environments is therefore not only a matter of designing nice surroundings, but equally a focus on inviting the users to attune through concrete practices of place-making. Despite the stress of the birth process, and the life-changing event of being a first-time father, the newly designed birthing room made them “feel right” (ibid., p.129) by “actively co-constituting the atmosphere, generating autonomy, enabling the subject to better attune to the space precisely because their attentiveness to the atmosphere was heightened” (ibid., p.130).



Figure 2 Sensory delivery room in Herning, 2017

In the same sensory delivery room, Nielsen and Overgaard (2020) explored how women's positive experiences of the sensory delivery rooms were connected to the welcoming atmosphere through positive distractions, and the room's adaptability to the women's needs, as most of the women found that the ambience of the room gave them a sense of empowerment in actively and autonomously exploring the room and its facilities. The sensory delivery room thus signaled respect for the family's needs through supporting the interaction between woman and birth companion (Nielsen & Overgaard, 2020, p.1). Similar to the findings of Goldkuhl et al. (2022), the role of the midwife affected the experience of the room so that "the effect of the midwife and the room appeared inseparable" (Nielsen & Overgaard, 2020, p.5). Hammond et al. have looked at the midwife's experience of the work environment in birth environments, concluding that: "We propose that the design and aesthetics of hospital birth rooms, including the objects and structures within them, act as generative mechanisms sending messages to midwives about what is possible and permissible in the birth room. These messages elicit emotional and cognitive responses from midwives, and such responses can shape the activities and behaviors that constitute individual midwifery practice" (Hammond et al., 2014, p.93).

Taken together, it is highlighted that an aesthetically pleasing environment, with many possibilities to change and meet shifting needs for safety and agency, is important.

The Know-Do Gap

"We know very much about how to save lives and build strong social relations during the birth, however working focused with the healing architecture and the multi-sensory experience is new to us", Obstetric specialist surgeon Lars Burmester.

The "Know-Do" gap between what we know and what we do in healthcare practice was first presented in 2006 by WHO as "one of the most important challenges for public health in this century" (WHO, 2006, p.1). Current research in healing architecture and birth environments invites and equips practitioners to design comforting and healing delivery rooms. However, as stated in the quote above by obstetric specialist Lars Burmester from Hjørring, translating knowledge into practice might neither be easy nor obvious. If it was only a matter of translating the knowledge into practice to bridge the *Know-Do gap*, why does the newly renovated delivery room in Hjørring only present minor changes, and why is knowledge from music, art, and architecture not present in the renovation?

Becker et al. described how the field of HA struggles to move beyond research for either justification or incremental change and is incapable of rethinking and innovating (Becker et al., 2011). In the quest to legitimize itself as a valid approach, the primary goal of research is to justify design proposals by employing evidence-based models (experimental and quasi-experimental, comparative research design) focused on outcomes to convince stakeholders of the causal relationship between specific interventions and outcomes (Becker et al., 2011, p.116). This method is designed to deliver results in a closed environment detached from its contextual noise. Hence it is obvious that while every part of a healthcare design is understood and studied in detail, the broader contextual, cultural, and somatic dimensions are often left outside the comforts of most healthcare personnel. It might be useful to consider the body and the space as containers isolated from one another in research for justification. However, in situations where there is a need to rethink the foundational premises of a field, it is crucial to develop and encourage research for innovation demanding a "deep understanding" and asking new questions (Becker et al., 2011, pp.119-120).

Additionally, an engagement in research for innovation practitioners must be guided by a conceptual framework and ecological theory that reflect the complexity of the problem being approached, but also new methods that combine scientific knowledge with, for example, artistic and design knowledge (Lawson, 2010, p.97). It is evident that addressing in-situ situations demands a bottom-up approach, cross-pollinating theory with practice-based work to secure a higher ecological validity to acknowledge the contextual dimensions. This demands a different interdisciplinary approach than the stacking of different research results. Within the sociology of science and technology, Matthew David has proposed that the entrenchment within forms of reductionist and relativist epistemology can, and should be overcome by adopting reflexive epistemological diversity (David, 2005, p.22). Introducing reflexive epistemological diversity in the field of HA would demand taking its starting point in an interdisciplinary attunement to create a common ground from which to work.

Existing research in the field of HA points to the importance of interweaving the active and sensory competent human, and considering the room as a sensory instrument, where **the space is a carefully crafted multisensory composition that can be played by skilled practitioners to support the act of care.** For this we need a new inclusive framework that can bridge the world of treatment, efficiency, and utility with the world of feelings, emotions, and understanding, approaching the space from a multi-sensory and somatic position. We therefore seek to test a model to start bridging the *Know-Do* gap for the design of sensory delivery rooms based on interdisciplinary attunement with artistic and design knowledge, and a conceptual somaesthetic framework and ecological atmosphere theory to engage in needed research or innovation.

4. Atmosphere, somaesthetic tool for interdisciplinary attunement in healthcare design

Approaching the creative process of crafting a perceptual experience in a complex healthcare domain demands a common theoretical and conceptual framework, which allow doctors, architects, musicians, nurses, actors, midwives, cleaning personal, patients, etc. to meet on common ground, speaking the same language despite the obvious different epistemological traditions. To establish a common ground and avoid the danger of silo thinking, the authors suggest establishing an ecological common ground using the concept of *atmospheres*. The concept unites the creative, social, and clinical disciplines in a shared embodied “language” of sensory experience. The concept of *atmospheres* was used as a tool to access a shared language of sensed somatic qualities, described by each individual discipline. Approaching the concept of atmosphere as a universal property of space is described by the German philosopher Gernot Böhme as a metaphorical “cloud” hanging in any space, affecting any passersby (Böhme, 2011). A wide range of external forces and stimuli continuously transform the cloud; the color of the wall, the placement of the window, the trees, the stainless table, or the sound from the mouse and keyboard, the smile and tone of voice, etc.; anyone and everything affect the atmosphere and shape the appearance of the cloud (Overholt & Skouboe, 2017). According to the Gernot Böhme (2017), atmosphere surrounds felt spaces where objects, forms, and colors are distinguished. The aesthetics of an artwork is a response to certain aesthetic needs, feelings, and desires; hence this is very familiar to us, and we have a rich language when we are presented with a description of the felt surroundings.

People not only perceive the world on the basis of atmospheres, but they also perform activities and practices, and thus transform atmospheres in order to attune themselves to new

and unfamiliar settings and situations (Folmann, 2021, p.129). Through the lens of atmospheres, it is evident that we adopt an approach to meaning-making as an active and embodied dynamic relation between perception, action, and meaning. Perception is thus not a passive one-way process but a relation between meaningful affordances in tuned spaces and human capabilities, and capacities to attune and resonate with them. These capabilities can be empowered and developed by making possibilities to “tune” the space as well as being “tuned” by the space physically available (Edensor and Sumartojo, 2015). In this way, the space can offer itself as a supportive element in the complex experience of bringing a new child into the world, whereas entering a white-walled hospital environment, with its highly visible medical equipment, can be counterproductive for attunement and active engagement in the situation (Folmann, 2021, p.130). Objects in the room orientate themselves not only towards the staff but also toward the couple, counteracting the feeling of being in a calming place, and the practice of attunement counteracts the absence of attentiveness to felt atmosphere.

The felt atmosphere becomes a common social interface of space; it is in this cloud your feelings are affected, and it is in this social dialogue you engage when visiting the delivery rooms. The cloud connects the first-time mother with the healthcare staff in a delicate dialogue with space. The artist Olafur Eliasson uses the term *felt meaning* of spaces to differentiate intuitive sensibility from our more primitive animal nature. A felt meaning is something we sense without the conceptual grid, or architecture, or words to attach to it. (Eliasson and Bukdahl, 2015, p.17). It is in this description of felt meanings we find the important connections between the disciplines of art and health. Working in the domain of existential sensed space remains the core of both healthcare and artistic practice, not to state that these domains are not addressed in traditional healthcare science of the white clinical and professional atmosphere described in the beginning. This article attempts to establish an argument that feelings in healthcare spaces have existential value, and the felt space is more than an efficient white container; stepping into a hospital means taking a step closer to life rather than stepping away from the world. Through the sensorial experience, art can become a central tool to communicate things that words and brochures cannot express or capture. It becomes an act that establishes an existential bridge to a new version of oneself through bodily experience.

The American philosopher, Richard Shusterman, introduced the concept framework of somaesthetics as a philosophical framework to combine body and mental dimensions of human beings into inseparable parts, in opposition to the "body-mind" dichotomy. This tradition is “devoted to explaining the nature of our bodily perceptions and practices, and their function in our knowledge and construction of the world” (Shusterman, 2003, p.112), advocating for the importance of creative and active engagement over traditional aesthetics. In the case of a birth situation, each human body is going through very different experiences but must meet in the end as a whole family - in minds and bodies at the same time. As atmosphere is multisensorial by nature, a key activity in the space is to develop our knowledge and construct the knowledge of a new world – a world where I become, and where we become actively and creatively part of a larger society in a particular place with a particular language and cultural richness. By separating mind and body in white voids we oppositely understand the body as a passive living machine; however, according to Shusterman (2000), we are missing very important existential parts of what it means being a human.

It is with this mutual understanding that the interdisciplinary team used the concept of somaesthetic felt meaning and atmosphere - as tools to establish a common ground moving into the unknown territory of the design experiment. If we are to unfold the vision to gain a higher

ecological validity, the design process would need to conduct a multi-sensorial and multi-disciplinary practice. This shift demands a novel focus on the interaction between multiple interacting elements at once: the mindset of the woman giving birth, the feelings of the surgeon, the physical décor, the interplay of the senses, the felt atmosphere, and the activities in the delivery room, etc. In design theory, this is termed a *wicked problem*. Wicked problems have no clearly defined problems to begin with, and design researchers construct a future where “results do not come in the form of knowledge about things at hand, but in the form of suggestions for a change of a present state” (Hallnäss & Redström, 2006, p.128). With this mutual understanding, the interdisciplinary team enters the design process for four delivery rooms in the Northern part of Denmark.

5. Case: Somaesthetic approach to delivery room design

Based on the above-mentioned somaesthetic framework, a design process was conducted from January 2020 to January 2021. The interdisciplinary team involved midwife, obstetric surgeons, architect, composer, painter, and a nature photographer. The team holds six years' experience in sensory delivery room design, including scientific and artistic contributions in sound design, responsive lighting, art, and healing architecture. The design process builds on the following hypothesis:

By approaching the delivery room design as a somaesthetic instrument, and moving familiar local nature moods inside the delivery room as positive distractions, combined with the home like décor, we can empower the parents and midwives to reduce stress, help parents be more self-reliant, help pain management, create more active partners that will support family-building dynamics, support the midwives' relational work, and in general build better and more memorable environments for the midwives, birthing women, and their companions, without compromising safety.

In the following section, we will describe the design process to help share knowledge from behind the scenes of making a somaesthetic delivery room. The process was developed in three phases. Each phase informs the others, and the design process is a product of several iterations back and forth to match the visions of the perceptual stimuli and the physical hardware setup to the atmosphere in the space. In the following section we will describe the three phases: concept design, building an interactive instrument, and crafting atmospheres.

Concept design: Atmosphere as interdisciplinary mediator

In the concept design phase, the interdisciplinary team used the theoretical framework mentioned above to establish a common ground. As a conceptual tool, the team used the concept of the performing atmosphere as a conceptual vehicle/framework to establish a common ground. The common ground was rooted deep in each member's sensed and embodied memories and experiences; this abstract common ground enabled the group to describe the somaesthetic gap in the existing delivery rooms. This enabled a shared critique of the existing practice and a mutual understanding in the design team, which was essential in moving forward in the design process. Using the concept of the sensed atmosphere as a conceptual vehicle allowed the staff to see their world in another view, and describe the emotional, functional, and social needs from the perspective of an expert. Such as,

“It is important that the atmosphere is welcoming and calming to all families because that will affect their birth process positively and stimulate the building of trustful relations to the midwife and doctors. It is also important that the occupants can customize the space to their needs and wishes, this will stimulate the feeling of self-empowerment, and ultimately stimulate self-confidence at the critical moment of birth.”; “It is also important that the atmosphere is in the background, leaving the stage to the couple’s experience of the birth, and the building of social relations. At the same time, the atmosphere should support pain management and breathing frequency during birth”; “It is important that new procedures or hardware does not compromise safety”; “It is important that in case of emergency the atmosphere is easy to switch off”.

These observations create demands to the spatial atmosphere and create a range of interdisciplinary aesthetic and social ripple-effects into the formulation of a design concept. For example, a calming and welcoming atmosphere was made by using homelike décor and moods specially crafted to support circadian rhythms and bring calming moods from local nature into the delivery rooms. The team agreed to see the space as a somaesthetic instrument using décor, room lighting, projectors, and loudspeakers to shape the atmosphere of the space.

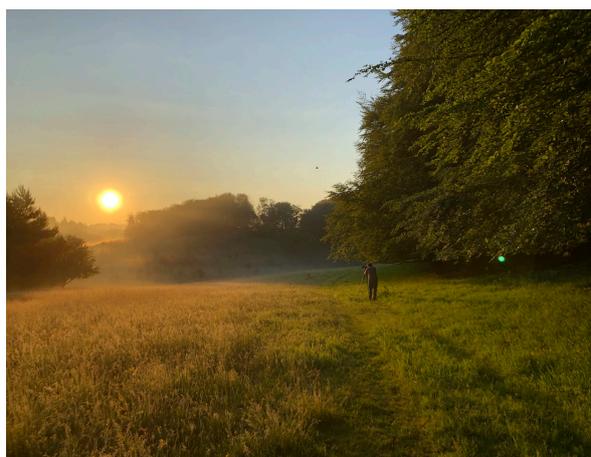
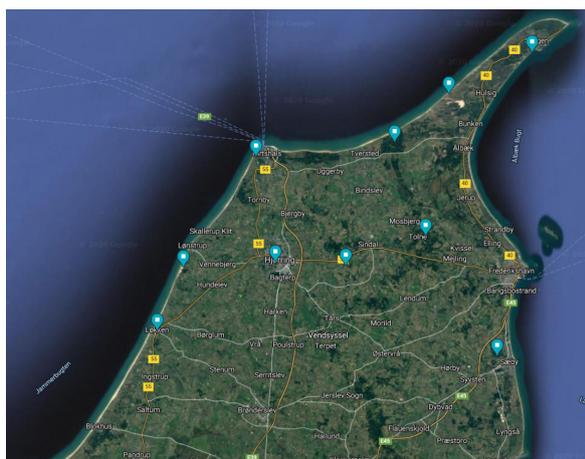
This decision was motivated by research promising a series of positive health outputs, evolving by moving nature inside healthcare environments, which include improved physiological response, improved cognitive functioning, improved emotions and moods, improved physiological response, improved cognitive functioning (Browning and Ryan, 2020, p.242). In the literature review, the authors also found that video screens placed in the windows of the hospital showing images of nature were found to lower blood pressure, lower heart rate, and had positive psychological benefits for workers in windowless spaces (Kahn et al., 2008), which opens the possibility of using digital screens. Also, nature sounds can have a positive impact on heart rate, blood pressure, and sympathetic nervous system activity (Ulrich et al., 1991), hence the interest in the local natural sounds. Furthermore, there is evidence of how listening to calming music can lower anxiety and experienced pain during labor (Chuang et al., 2019). Listening to music can increase positive emotions and patient satisfaction, and decrease negative emotions and perceived threat for women undergoing a caesarean section (Kushnir, Friedman, Ehrenfeld & Kushnir, 2012). Music also decreases the associated anxiety (Eren, Canbulat Şahiner, Bal & Dişsiz, 2018), motivating the demand of being able to play your own music during labor, and working carefully with musical compositions, mixing natural sounds with music compositions.

Lastly, a series of more functional demands were included as, e.g., an easy-to-use tablet interface, a wall switch enabling the modes start, stop, and trigger emergency scenarios, and a general understanding of the birth practice and protocol in the space. Based on the theoretical framework, the sensory delivery room should furthermore heighten patients perceived safety to support the feeling of home and sense of belonging, by making the installations site-specific, attuning with their everyday, known environments.

Crafting Atmospheres

To create a welcoming multisensory atmosphere that supports the existential situation and stimulated a strong sense of place and time, the team decided to capture meaningful and familiar local moods in nature. The hypothesis was:

If we can stimulate memories of positive calming nature experiences, we can stimulate a sense of belonging, consequently triggering the women's conscious and sub-conscious somatic response systems to help them perform in the different phases of the birth. The embodied memories will help them support the feeling of belonging, safety, and pain management.



Figures 3 and 4 Left: Maps of meaningful sites; right: from on Recordings in Toldne.

To understand and capture the important situated atmospheres from nature, 30 semi-structured interviews were conducted with local pregnant women across the region. In the questions, they were asked to describe an important calming memory from their local nature, and to mention meaningful local places (quotes from the interviews are used as image text below). To some, these questions were abstract, and the interview was supported by: *Can you describe the experience from nature that you would love to pass on to your child?* This question triggered all couples to long, detailed reflections on experiences from their childhood, and detailed descriptions of sensed experiences. The interview was structured with 15 questions and conducted via phone calls; this gave an informal and friendly conversation of 15-30 minutes, and delivered a range of high-density situated information about the important, situated nature experiences. Any place named in the interviews, was plotted into a map as *Landmarks* (see above). Together with the description of personal experiences in nature, the interviews served as input to the creative process of ‘chasing’ moods.



Figure 5 Image from the mood Home: “The sound of Nordjylland to me is the sound of calming waves hitting the beach”, Woman 28 years

During the period 2021-2022, the artistic team traveled the northern part of Denmark chasing local moods described in the interviews. A prerequisite for recording the moods was an understanding of the technical output in the immersive spatial instrument described above. The room was designed to make a ten-meter continuous video and omni-present sound, which required the sound recordings to be recorded by a Ambisonic field recording system, and the video to be 8K resolution to get the quality needed (Canon EOS R5 & DJI Maveric II drone).



Figures 6 and 7 Images of the field recordings setups. Left: video and sound recordings at Toldne.
Right: Morten Hilmer working in the white landscape.

The details of the specific design practice were messy, intuitive, and beyond this paper to unfold in more detail. It builds on artistic knowledge, technical skills, intuition, creativity, curiosity, and the ability to work closely together. As a guiding tool the artist group used the somatic atmosphere descriptions from the interviews. The compositions were developed by the individual artists and assembled in a 1:1 test setup, consequently leading to discussions compromises and changes, see image below. The test was highly pressured because it rendered a common understanding of the felt experience; the specialist could then detail the final compositions. The 100+ hours of recordings were cut into 4 one-hour moods; each cut is played for a minimum of 5 minutes, stretching from morning to night. This rhythm enabled the room to tune into the present state of mind. Hence, if the couple entered the room in the morning, the

algorithm could trigger the morning in video, sound, room lighting, etc.

The team worked with two types of moods: *ambient* and *birth*. The *ambient* moods were the calming, known, and welcoming moods of morning, midday, evening, and night. In these, specific known local signature locations were included, based on the interviews. It is important that this deep, local connection to nature is present in the visual environments, because it may render good and calming memories. For the installation, three *ambient* moods were developed: *Drømme (Dreaming)*, *Ro (Peace)*, and *Hjem (Home)*. *Dreaming* was recorded in the spring, *Peace* in winter, and *Home* in autumn; this allows for a vivid image of the local nature moods. The *birth* mood was more intense both visually and aurally through rhythms of ocean waves to support breathing rhythms and pain management. The results were four moods: *Urkraft (primordial force)* where sound and videos from the local Westcoast during a storm supported the more active atmosphere in the space and the supporting breathing rhythm.



Figures 8 and 9 Images of the test setup. Left: 1:1 studio installation. Right: Spatial representation of sound.

Based on the interviews, we could see a very diverse taste of music; however, natural soundscapes have a specific calming role for most women. Therefore, the team works with a new type of musical composition using field recordings as a means to make soundscape generated music. The music resonates with the recorded sounds to create music from the existing tonality of, e.g., birds. These choices were based on the existing research explained above, and interviews together with research in soundscape assessment that suggest how soundscape quality most often matches perceived quietness. The soundscape in the delivery rooms is therefore designed based on Andringa and Lanser's qualitative cognitive model for soundscape design, highlighting the role of ample safety indicators mediated by proximal situational awareness and subtle sounds, to enhance a pleasant quiet environment that promotes health (Andringa & Lanser, 2013, p.1440). On the other hand, an unpleasant environment forces one to attend to particular sources, promoting reactivity and reduced options to relax, and other forms of proactive self-selected behavior. As such, pleasantness and the absence thereof is an indicator of whether we exhibit proactive or reactive behavior. A calm soundscape is therefore characterized by the absence of disturbances and pressing situational demands.

As a delivery room is also a workplace with functional sounds that cannot be removed, we therefore aim instead to introduce ample safety indicators in the background to both mask and

remove awareness of the functional sounds. It is established in research literature on soundscape assessment that, to achieve a high level of tranquility, the perceived loudness of natural sounds (e.g., nature, wind, water, natural elements, countryside, rain, birds, and music) should be higher than human and mechanical noise (Gustavino, 2006; Pheasant et al., 2008; Andringa & Lanser, 2013).

Another strategy we use to promote safety is through heightening the feeling of control over the environment, by being able to choose the moods and the volume of the soundscape. The relation between our core affects and state of the environment is therefore one where individuals are not forced out of safe mind-states by annoying sounds, as pleasant sounds that they feel they can control allow them to stay in a calm mind-state, and therefore also allow them control over their mind-states. Calmness and perceived safety are results of a holistic assessment of the meaningful relation of the individual to the environment, where there is a presence of meaningful sounds supplemented by other sensory impressions, so that there is a meaningful whole and few “foreground” percepts stand out (Andringa & Lanser, 2013, p.1441). Visually presented landscape vegetation can amplify this effect (Yang et al., 2011). The more we can connect to a quiet ambiance, the more we can experience a feeling of quietness. An ambient soundscape helps our proximal monitoring because our omnidirectional sensitivity is activated, easily promoting a feeling of safety. Therefore, we use 6 speakers – 5 spread out, and integrated into the ceiling - plus a subwoofer. With this system, it is possible to play natural soundscapes at low volume without losing perceived sound quality.

Building an interactive instrument

Inspired by previous experiments in Herning (Nielsen & Overgaard, 2020), the sensory delivery room was designed as a welcoming space, using home like furniture, table lamps, and cabinets to hide the clinical hardware. Furthermore, the room is stripped of the laminated guidelines, and the white tile on the wall is replaced by a digital projection. The overall space was divided by an acoustic screen, with a painting resonating the colors and landscape of the region, and separating the technical domain from the more home-like space.



Figure 10 Image of delivery room. Divided by a decorated mobile acoustic, the delivery room has a home-like space with media-art installation to the left and a birthing section to the right.

Building a space that can attune to circadian rhythms, and help welcome the mother and her companion in a mood that resonates with their state of mind, is important. When the couple enters the room at night, the atmosphere of the space should resonate the circadian rhythm, supporting a coherent atmosphere, and boosting a sense of belonging. Another important demand to the instrument was the multisensory and immersive experience being inside a nature-like mood, the perceived intensity should be calming and stay in the perceived background, leaving room to the social situation of the birth. The natural moods should become a positive distraction in the background during labor. However, in the last stage of birth, the atmosphere should increase in intensity, supporting the woman's pain management and performance, like dance music can support the dancer. In order to talk to the senses, the space was upgraded to an immersive spatial instrument using a 10-meter digital projection, integrated with lighting, and a 5.1 sound system. The result is a delivery room setup, which can change the atmosphere radically, according to the situation. It is controlled by a switch on the wall, or a tablet placed on a cabinet in the birth environment.

Building a welcoming space, which is attuned to the temporal atmosphere shaped by the circadian rhythms was important. Another important dimension is the social and personal empowering actions that include people's personal choice. This could be to customize the space, by choosing between different atmospheres, fine tuning light intensity or volume, or enabling a favorite music playlist. The delivery room is an instrument for the couple to feel at home, and it is when the space intuitively interviews their needs new social dimensions of empowering are observed.

The principal participation strengthens the dialogue between the woman and her companion, and supports the family building dynamics. The interactional dimension is the staff, who need a fast interface, hence there are 3 switches on the wall: "On" activates the circadian algorithm, and chooses the best matched atmosphere. "Off", all hardware turns off. "Cleaning" (or emergency), all lights full power for cleaning and emergency mode. Altogether, these three interaction dimensions are important when approaching welcoming, and inclusive interactive spaces for healthcare design.



Figures 11 and 12 Images of the delivery room. Left: The birthing section include a chair to the father and cabinets for technical equipment. Right: Image of the home-like media-art installation in the mood "Hjem" (Home)

6. Reflection, and future work

“Cure Sometimes, Treat Often, Comfort Always” Hippocrates 400 BC

We must acknowledge that hospitals are both working places for staff, and at the same time are surroundings for the most important moments in our life. The hospitals are a background for life-changing events, such as the birth of children, the death of a loved one, or a life-changing diagnosis. Hospital spaces are more than spaces for efficient and secure work, they are places for some of our most important events from which come memories for the rest of our lives. In ancient cultures, many of these events were accompanied by rich spiritual and ritual practices, including music, dance, special objects, poetry, spiritual sculptures, and spaces. These rich cultural artifacts shaped our understanding of ourselves to help us navigate our own social life. Art is not only relevant as existential comments in museums, but it belongs in the heart of our self-understanding; somaesthetic health practice can serve as an instrument of care, and present a rich alternative to the clinical environments. We are not asking for a new golden standard for randomized clinical studies, or faster, and more efficient births; however, we are interested in using somaesthetic practice to support the act of human care.

The concept of atmospheres, and attention to the ‘felt meanings’ of a space, can serve as a conceptual framework to bridge the know-do gap in healthcare, because bodily feelings can be our common reference point despite specializations. Designing the experience, cannot be left to the architect alone, because of its multisensorial nature. Bridging the different artistic domains allows teams to open to a much richer sensorial experience. In the case presented in this paper, the delivery room was designed as an instrument, firstly presenting a calming and homelike décor, and secondly being equipped with digital technologies that allow the space to adapt to time of day, and the personal wishes of the users. Giving the users the choice to shape the atmosphere of the room gives them the feeling of having control over the situation; user customization delivers a dimension of social empowerment that is highly important. Realizing this vision would not always rely on complex technological innovations, but to the sensitivity of the ‘existential space’ described by the theoretician Christian Norbert-Schultz (1968). Various biophilic, low-tech design strategies can also function as an alternative, however, within the clinical context of a delivery room, the hygienic standards are very strict, often challenging the aesthetic visions of bringing nature inside (Browning & Ryan, 2020).

Effects and side-effects need to be well understood before a surgeon can change practice. Through systematic trial and error in controlled environments, a rich curiosity and healthy academic skepticism has moved the healthcare practice into a credible research-driven practice. The authors feel privileged to work in this domain with curious and critical healthcare staff. It is with this attention to details and curiosity for new scientific methods we need to build evidence for a new existential healthcare design paradigm. It is clear that we need to move away from evidence-based practice to research-based practice (Frandsen et al., 2009, p.3) to address the novelty of this approach. This would also include alternative qualitative methods in the clinical trials. However, the process of including such new criteria for validity poses problems for evidence-based design, as the increasingly diverse interdisciplinary theory and methodology put pressure on the comparability of evidence-based design to evidence-based medicine, which has been an important part of its legitimization in the healthcare industry (Højlund, 2017, p.31).

The authors of this paper have both been involved in other healthcare environment transformations. In all projects, there has been a wish to measure the clinical effect of each

intervention. However, the clinical data have until now not proved a significant effect that can be causally explained by the sensory delivery rooms. This has led to frustrations, and statements from staff and users such as “the numbers do not show what we experience (hear, feel, etc.)”. The evidence is lacking – however evidence is a specific knowledge form in the hospital, based on specific, legitimized research methods, such as the randomized control trial, whereas other forms of research knowledge such as ethnographic studies do not count, or have the same weight.

Instead of only chasing singular clinical evidence, we want to end the article by suggesting two areas that we believe calls for future work and research, based on mixed methods across quantitative and qualitative research:

- 1) Comparative studies that seek to answer if a video of a postcard-like coast with peaceful waves without specific familiar locality would be as effective as the local beach from your childhood memories? *If* and *how* the localness matters to enhance the perceived calmness and familiarity in the room.
- 2) Research that focusses not only on how moving from the institutional aesthetics to the new type of integrated décor matters in “itself”, but equally important it is our experience that this must go hand in hand with a cultural change and full commitment from the health staff on all levels. Our experience is that the full potential of these interventions goes beyond the experience in the room; music, beautiful nature videos, integrated paintings, homelike décor, high quality wooden furniture, and attention to details. The striving for excellence through experimental work has caused a new, positive cultural change in the maternity ward.



Figure 13 Image taken during a water birth in the Winter mood “Silence” at the North Denmark Regional Hospital

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Photo Credits

Studio Poesis (1,2,4,5,7,10), Hospitalsenheden Vest (3), Morten Hilmer (6,8,11), Marie Højlund (9), Regionshospitalet Nordjylland 12, 13, 14, 15

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