

*Envisioning a Healthier Build Environment for Elderly People with Dementia in Denmark
- A Conservatory for People and Plants*

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Abstract

Scientific research has shown how exposure to daylight and continual contact with greenery, natural elements and habitats are crucial factors for human well-being. In the wake of these findings, it is highly important to improve access to facilities that enable and promote these effects of increased life quality and well-being among all groups of people in our societies. The paper describes an in-progress project focusing on how to enhance the everyday conditions of elderly people in a care home setting in Denmark, all of which are living with Dementia. The paper presents a vision for a new physical extension to the existing building structure on the care home location that supports everyday life, activities and the overall well-being among the residents. The vision can be seen as the first step in the development of a set of generic guidelines for the design and use made to be transferred and tested in other settings in Denmark and internationally. In drafting and designing the conservatory the project group employs principles of Universal Design in combination with newer research findings on the health-promoting potentials of spaces characterized by access to natural light, plant growth and living environments. Furthermore, the work rests on a holistic ambition to create brighter, greener, naturally aligned and healthier conditions for residents, care home workers and visiting relatives alike.

Keywords: Health Design, Care Homes, Elderly People, Dementia, Daylight, Nature, Greenery, Universal Design

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Introduction

This paper presents an evidence-based vision resulting from the initial phase of an interventional research and design project in progress. The work is conducted in a care home located in the municipality of Greve, Denmark and sets out to create a bright and green conservatory with health- and welfare-enhancing effects in the care home facility that is primarily dedicated elderly residents living with dementia. Our overall ambition is the creation of a supplementary built extension to the existing structure that supports the general well-being as well as the maintenance of bodily and sensory faculties among the elderly residents. Furthermore, the project will result in the formulation of a set of generic guidelines applicable in future projects aimed at enhancing existing care home structures and/or creating new facilities and design solutions suited to improve the well-being and general life quality among elderly people living with dementia in care homes, nationally in the Danish context, as well as internationally. As a research team working within the realm of Universal Design, we are also preoccupied with an inclusive and holistic approach to the project in question. In this regard, the built extension also seeks to accommodate and include the array of other actors with a relation to the care home; care workers, visiting relatives along with other regular and professional users of the facility. Inherent to this ambition is the possibility of enhancing elements that adhere to both personal and professional lives for the broadest possible number of people within the care home setting. To the research team a central core value in both practical and academic regards consists in the creation of a space that succeeds in providing beneficiary and health-promoting qualities to all participants in the facility. Currently, the project is in its initial stages, thus the paper will focus on the overall vision and general outline of the work in regards to the background knowledge on which the project rests, the primary motivations, a number of preliminary methodological considerations, as well as the general visions, expectations and future goals actualized in the finished and final conservatory.

Background

The dementia prominence currently emerging on a global scale present a significant and acute challenge on both individual, social and societal levels. In Denmark and Scandinavia, as well as internationally, the dementia prevalence relates to the demographical changes and the so-called *aging societies* (Harper, 2006). As dementia is connected to a number of illnesses often developed in the later years of the human lifespan, we currently see an increase in dementia prevalence that is closely tied to longer life spans and increased life expectancy. The World Alzheimer Report (Prince et al, 2015) reveals that approximately 1-2% of people aged 60-64 years develop dementia. This percentage further increases to 24-45 among people aged 90 years and above.

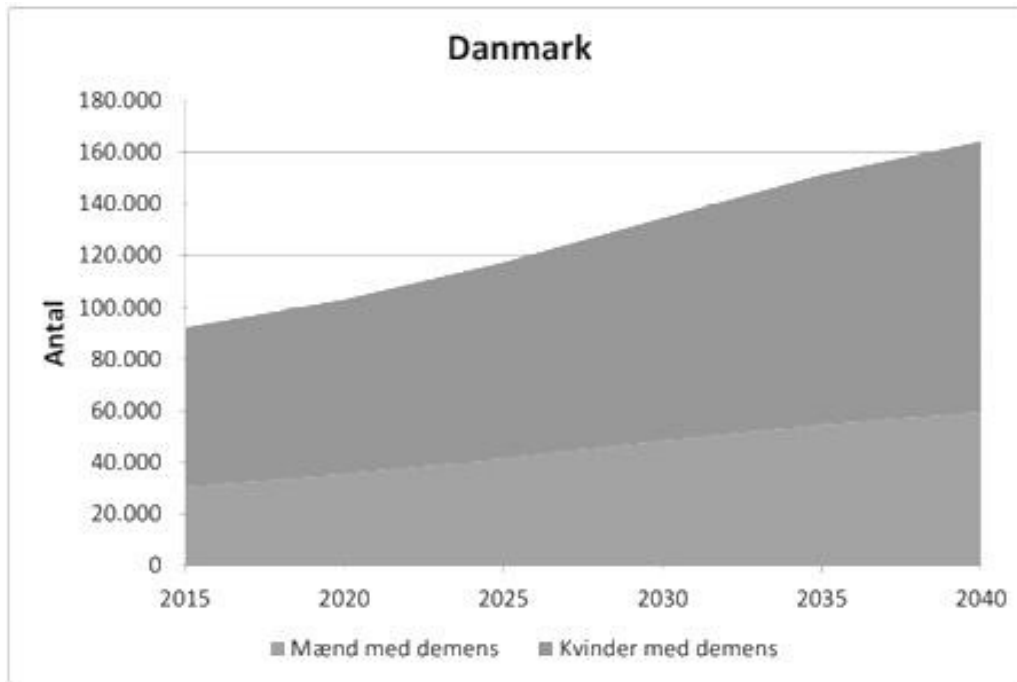


Figure 1: The expected increase in numbers of people having dementia in Denmark from 2015 up until 2040. The illustration is based on statistics from 2013. The top dark grey part of the graph illustrates how large a number of the total amount are woman, the lower part illustrates the amount of men.

Source: Nationalt Videnscenter for Demens (National Center for Knowledge on Dementia): *Forekomsten af demens hos ældre i Danmark. Hele landet og de fem regioner, 2013-2040.*

In Denmark (approx. 5.8 million citizens) the Alzheimer Organization estimate that of the 40.000 elderly people above 65 currently living in care homes, 60-80% deal with severe and progressed conditions of dementia. Seen in the perspective of current and estimated future life expectancy and demographical changes occurring worldwide, the need for attention (and solutions) pointing towards ‘dementia-friendly’ initiatives and environments are highly relevant and acute. Following the statistics presented above, we face a number of societal challenges in accommodating the life situations of people currently living with dementia in care home settings in the best possible manners, but also in preparing for a larger group of elderly people with dementia in the years to come. This challenge also adheres to the built environment and to the acknowledgement of the means, methods and potentials inherent to architecture and design initiatives that are able to promote and support health and well-being among people with dementia. With this project, we aim to develop and propose a design solution, and a set of generic guidelines and principles, hopefully able to alleviate and ease some of the brute and devastating consequences and conditions experienced by people living with dementia. This need comprises a main motivation, thus the primary foundation, of the project described in this paper.

Method – Mapping the Environment

In working with the project as an evidence-based intervention, we apply a number of on-site data collection techniques and methods. The methodological combination comprises both natural scientific measurements and qualitative approaches that enable us to gather and produce knowledge (data) on which the design process, the general development of the project as well as the subsequent formulation of generic guidelines rests. A central goal

with this effort is to obtain a substantial insight into both qualitative and quantitative aspects of everyday life in the care home. The acquisition of knowledge is primarily focused on the general life situation among the residents (with dementia), but we also concentrate on the staff, other professionals with errands and doings in the facility as well as on visiting relatives. Furthermore, this ‘mapping of the environment’ carried out by field-research methods aims at analyzing the application and meanings ascribed to the different existing rooms and settings in the care home. In Denmark, the residents of care homes have their own room, sometimes two adjoining rooms, along with their private bathroom. Meanwhile, they also have a set of common facilities (indoors and outdoors) at their disposal in which different activities, pursuits and chores are arranged and conducted. In order to understand the physical premises as well as the individual and social application of the existing environment, we intend to employ the following methods in our data collection.

- Analyses of the physical environment (indoors and outdoors).
- Conduction of participant observation and focused ethnographic fieldwork (e.g. Hammersley & Atkinson, 2019).
- Structured observations (concerning use of the existing environment, activities, daily chores, patterns, routines etc.).
- Measurement of daily light exposure among representatives of both residents and staff (pin-sized technology).
- Interviews with residents, staff and management.
- Application of specific dementia-sensitive observation tools (yet to be determined).

The primary objective with the field research employed is to establish an empirical understanding of the everyday routines and patterns shared by residents, staff and visitors in the care home setting. Furthermore, the research approaches employed contribute to our knowledge about the specific care home facility, its concrete physicality and the activities, practices (in terms of daily patterns, care work etc.) and other routines that define the setting and the everyday among residents and staff. This knowledge is a central component in the subsequent design process as it reveals how specific rooms and facilities play certain roles in the structure of daily living. Furthermore, the application of on-site research methods contributes to central design-related insights applicable in developing the physical extension to the existing care home structure: e.g. the best possible position/placement in relation to daily patterns of movement, activities and social/institutional practices and logics. In order to ensure the best possible design-solution in terms of practical accessibility, planned as well as intuitive use and general relevance in relation to residents and staff, we conduct this on-site ‘mapping’ of the care home environment.

Scientific Foundations

Light and Exposure to Light

As human beings, we have evolved underneath the sky in close relation to daylight and the impact of rhythms induced by the sun's movement across the celestial body. Recent scientific findings reveal, that we, as products of this evolutionary process, need exposure to natural sources of light in order to stay healthy and well-functioning (Andersen et al. 2012). Daylight varies significantly in terms of intensity, color and directionality. Furthermore, it varies from day to day and from moment to moment. Instinctively, humans relate and adjust themselves to these changes and live in close connection with the conditions they impose. The variations indicate e.g. the actual season and time of day and these very direct and intuitive sources of

information informs our bodies and actions, thereby creating a connection between people, actual place/position and the natural environment at large. Research within the non-visual effects of light has progressed intensely and received an immense attention during the last 20 years. This is due to the discovery of a hitherto unknown light sensitive cell: intrinsically photosensitive retinal ganglion cell (ipRGCs) (Berson et al., 2002; Brainard et al, 2001). The discovery of this cell has underlined the important relation between exposure to (natural) light and well-being. The non-visual effects of light are related to a complicated system of photoreceptors which regulate the human biological clock and the circadian rhythm structuring general bodily timing, the production of melatonin hormone and thus the quality of sleep - effects that directly influence human health, performance and well-being. Research documents that light exposure and well-being are tightly connected, but these findings has also raised a discussion on how to identify and secure the proper levels of light exposure at the proper time (see CIE Position Statement, 2019; The Society of Light and Lighting, 2020). These discussions relate to particular issues on defining artificial lighting design schemes and to environments of artificial lightning in general. However, this project intends primarily to make use of stimuli obtained through natural sources of light. These findings indicate that daylight is of great importance for humans in general - and for fragile people with dementia in particular (Figueiro, 2008; Torrington & Tregenza, 2007; van Someren, 2006). Even though we in Denmark live in buildings often characterized by excellent levels of daylight, the interior light level will never be as intense as the levels occurring in the exterior environments in broad daylight. Due to this circumstance, we need to move outside in order to gain the essential/necessary amount of daylight exposure. Because some elderly people with dementia are cognitively challenged due to their condition, it can be difficult, as well as a personally craving and disturbing task, to make use of exterior environments for this group. Stimuli characteristic of the outdoors such as the wind in ones face, the sunbeams on the skin, the sounds, rain and other influences, as well as the more diffuse sum of these influences occurring in the outdoors environment, can be difficult to process and understand for people with dementia (see below). To this reason, persons with progressed conditions of dementia often prefer to stay in a more orderly and impression-manageable environment that is provided by indoors and more stimuli-sheltered facilities. This complex entails a need for developing news types of health-promoting and –beneficiary spaces within care home facilities (and other kinds of welfare institutions) dedicated and designed to accommodate this diverse group of people. The acknowledgement of the very clear and evident need for dementia-friendly environments has led to the vision and formulation of this project in which we seek to offer elderly people with dementia living in care home facilities (close to) equal opportunities towards the exposure to the naturally occurring and health-beneficiary daylight. Furthermore, research investigating how elderly people experience sensory loss (Rasmussen, Swane & Winther, 2020) and reduced mobility in everyday life, show how they become more depended on the complementary senses and their vision. These findings also illustrate how there is a distinct connection between seeing well, or hearing well for that case, and feeling well (ibid.) and how this is particularly pronounced among elderly people (Sörensen & Brunnström, 1994).

Greenery

In parallel to the descriptions of daylight and its health- and welfare-enhancing properties presented above, there is a growing body of scientific work concerned with the potentials and effects inherent to plants, greenery and other natural elements (e.g. Hartig et al, 2014; Sidenius, Karlsson, Lygum & Stigsdotter, 2017). Employing these findings, the second axis in this interventional design project is comprised by the strategic and active use of greenery

and a range of other growths and natural elements. Sitting on a garden bench, picking a bouquet of flowers, watching birds on the feeding board from the indoors are all different ways to experience and connect with the natural surroundings and environment. Promising research results indicate that this connection can benefit people with dementia living at care homes. Both quantitative and qualitative research investigating the effects of passive engagement with nature such as watching the clouds go by, and active engagements with nature e.g., weeding a plant bed, point to several health benefits. These include improved well-being and mood, decreased agitation and aggressive behavior, less use of medication, fewer fall accidents as well as improved sleep patterns (see Detweiler et al., 2012; Gonzalez & Kirkevold, 2014; Whear et al., 2014 for literature reviews). Furthermore, indoor gardens, plants and vegetation as well as views of natural and green environments can make the natural world accessible for people that do not have the opportunity, or a desire, to go outdoors. Simultaneously, indoor gardens and conservatories can be an advantage at care homes located in climates with long, cold and dark winters (e.g. in Denmark and Scandinavia) as they provide access to natural elements, surroundings and vistas during the inaccessible and uninviting months of the year. For example, a research study indicated that indoor horticultural activities at a care home had positive effects on the resident's sleep, their levels of agitation and general cognition (Lee & Kim, 2008). Providing possibilities to connect with nature in an indoors environment can therefore, with distinct benefits, be included as part of a strategy for improved well-being at care homes for people with dementia. When envisioning different ways to connect and engage with elements of nature from the indoors, and with people with dementia in mind, an array of design considerations has to be taken into account. This concerns e.g. physical access, seating, plantings and maintenance (Cooper Marcus & Sachs, 2013; Sigbrand et al, 2019) to allow for the right type and amount of natural stimuli to promote and enhance the well-being of this particular group of people.

Envisioning a Dementia-supportive Environment

The envisioned conservatory will contribute with a new supportive environment in the care home facility. Because people with dementia gradually lose their cognitive abilities as the condition progresses, their sensory perception and sensory faculties becomes increasingly important. As the cognitive capabilities declines, the affected people must rely on their senses to a much larger degree than before (Sonntag, 2013). Meanwhile, this also becomes problematic as the *sensory integration* – the processes in the brain that allows us to handle the information provided by our senses – suffer damage as the dementia condition progresses. Due to this people with dementia can benefit significantly from an environment characterized by simple, structured and sheltered sensory stimuli, allowing them to encounter and experience the world they inhabit in more balanced and manageable ways. This presents a challenge when working with design because all elements and present influences in spaces used by people with this condition must be balanced and manageable in terms of sensory ‘output’ and expression. Furthermore, it is favorable if different stimuli and sources of sensory ‘content’ are possible to differentiate from each other. In the conservatory, we are working with a principle of ‘small caves’ on the one hand, and a principle of ‘visibility/clarity’ on the other. It is important that the users of the conservatory are able to withdraw into sheltered and safe compartment-like nooks while simultaneously maintaining a view/an outlook over the entire space. Furthermore, we work with the notion of ‘experiential zones’ that adhere to all the human senses. In *zoneing the design*, we apply different functional ‘caves’, compartments and sections in the conservatory. The different compartments adhere to the social/individual possibilities of the design so that the users will

find a 'zone of rest', a 'zone of work/activity', a 'zone of chit chat', a 'zone of slumber' etc. The zones are equipped with appropriate furniture, objects and items (lamps, blankets, pillows, sofas, working tables, chairs etc.). This principle makes it possible to facilitate zones that are at once singular in their character contributing with a distinct atmosphere to the space, while also containing a range of different sensory influences that makes it possible to address and engage the users regardless of their individual sensory and cognitive faculties. By working with *a complementary approach to sensory participation / engagement* we aim to ensure that any user will receive a part of the present stimuli, impressions and experiences while staying in the conservatory. Following this principle of sensory attentive design all zones of the space seeks to engage with the entire range of human senses; the so-called 'outer senses' of sight, hearing, smell and taste as well as the 'inner senses' of touch, balance and movement. Describing this in detail, the 'zone of chit chat' that is dedicated social activities among two or more residents is defined by stimuli engaging with all the seven aforementioned senses. Besides the furniture that allows for the assigned activities, the different zones also contain auditory, visual, aromatic and scented qualities as well as design elements that engage with qualities of touch, balance and movement. In the 'zone of chit chat' a scent of the indoors greenery in the space; the herbs (alluding also to taste) and flowers in the interior bed intermingle with a vista of the park with its trees, grass and wild birds and the daylight entering the space through the skylight. Furthermore, a low-voiced sound of watery glug is appearing from the fountain in the acoustically balanced conservatory. Stimuli of touch, balance and movement are evoked through the application of tactile entities such as wooden materials, heated tile floors, blankets, and through different achievable levels of difficulty in regards to mobility, e.g. gentle slopes and small steps applicable to the elderly residents while using different parts of the conservatory. Obviously, it is a challenge to secure an adequate amount of sensory stimuli, as well as an adequate balance between these sources of sensory information, that apply equally well to all the users of the conservatory in a diverse group of elderly residents. This ambition entails a close collaboration with both users and staff in the design phase of the work but also requires a plan and a set of guidelines for the overall use as well as the maintenance and the ongoing adjustments of the space. Meanwhile, in applying the notion of 'experiential zones' in the design we are able to highlight a number of wanted qualities applicable by all users regardless of their sensory and cognitive conditions while trying to secure the highest possible degree of immediate, simple and direct albeit sheltered and structured exposure to natural elements. In line with the foundation in research pointing to the many health-promoting potentials of daylight and the presence of greenery, plants, vegetation and other elements of nature, we are working with the four classical elements as a general point of aesthetic reference in this project. By thinking through the elements of water, earth, fire and air we seek to develop a conceptual 'design scheme' that provide great inspiration, while also securing a consistent, simple and earthbound aesthetic line in the space. As the classical Greek notion of the four elements encompasses, all matter can ultimately be composed of these basic elements in different combinations. Furthermore, the fundamental elements are all important prerequisites for life, growth and well-being to both people and plants and therefore they have a central position in the design as well. In a concrete manner the four elements present a design strategy focusing on the use of natural materials such as wood, wool, plant fibers, soil and more. In a slightly more abstract perspective the active use of the four elements in the design contribute to making the conservatory a microcosm allowing for the processes of both human and non-human life and co-existence. In this regard, we work with the idea that the space must be suited to encompass and support the lives and well-being of both people and plants. In a holistic sense, the conservatory and the processes going on in this space (flower growth, fire from the wood stove in winter, grapes emerging in summer,

presence of water etc.), are both abstract images of life, as well as concrete and earthbound possibilities to partake in the very processes of life in the everyday life of the daily users.

Universal Design, Light, Greenery and Enhanced Well-being

In continuation of the descriptions above, the main goal with the interventional design project is to enhance a number of everyday conditions directly related to the elderly residents living with dementia. Nevertheless, the beneficiary properties connected to daylight exposure, greenery and the presence of other natural elements in the envisioned conservatory, also adhere to, and contribute to, the well-being and general welfare among the other groups engaged in the care home setting. Following the principles of Universal Design (e.g. Steinfeld & Maisel, 2012)) the build environment ideally should include any human actor, in any thinkable physical, mental, social and sensory state and/or circumstance. Subscribing to this design philosophy as a research team, we aim to reflect and acknowledge every possible need and requirement met by the elderly residents as well as by all other current and future users of the envisioned conservatory. Even though this ambition is set to fail at the outset, whereas total inclusion in the built environment remains an unreachable ideal (e.g. Gosset et al, 2009), the philosophy of universal design encourages us to work through all possible needs of any potential user. This applies whether this person is a child, an elderly person, a resident, a relative, a professional or any other one-time or recurrent user of the facility in question. In designing the conservatory, it is therefore also highly important to include the empirical knowledge produced during our on-site data collection in the care home (cf. section above). This material contains knowledge and observations regarding the individual needs (residents and staff) as well as the social and collective structures (residents in interaction with care workers, relatives, other professionals) in the facility. Simultaneously it also contains knowledge about the daily chores, patterns, pursuits, meals and other daily routines and activities that will constitute an empirical backdrop assisting us in the design and visionary process developing the best possible conservatory in the care home setting. By drawing on insights concerning the individual residents as well as the social/collective and situational wholes in which they partake during everyday life, we are able to ensure a design process, and a final product (the conservatory), taking both residents and all other actors into account in the best possible manner.

Conclusion

The paper presents a vision for an in-progress interventional design and architectural project with which we develop design principles and guidelines for a built extension to an existing care home structure. The central aim of the work is to provide a health- and welfare-enhancing space, a conservatory, for residents in a Danish care home in which the majority are living with dementia-related conditions in their everyday life. The project rests on a number of scientific findings pointing towards the many potentials of regular exposure to both daylight and an array of natural elements. Furthermore, the paper presents a number of methodological considerations on how to acquire empirical knowledge applicable in the design and developmental process as well as a scientific contextualization in existing work on the health benefits and potentials of natural elements in architecture in general, and in settings used by people with dementia in particular. In the paper, we account for the overall visions and motivations embedded in the work and simultaneously we take the first steps towards making these visions concrete and applicable in the design of welfare architecture. In this regard, the paper explores a number of preliminary thoughts on design principles and notions of a dementia-supportive environment with multi-sensory elements. Developing a notion of

sensory attentive design, we work towards the creation of a space defined by experiential zones that seek to engage with the entire range of human senses. With this approach, we aim to develop an inclusive space applicable by a wide range of users regardless of eventual cognitive and sensory challenges posed by dementia, or by other conditions. Finally, we relate the envisioned conservatory to the philosophy of universal design. Doing so, we empathize how the space will contribute with qualities of well-being and general welfare among the entire group of people with a relation to the care home setting.

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