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Faculty of Landscape Architecture, Horticulture and Crop Production Science

The Swedish BPSD registry and outdoor environment assessment

– Potential for development in dementia care

BPSD-registret och bedömning av utomhusmiljö

– Potential för utveckling av demensvård

Erik Nilsson

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ABSTRACT

Aging populations and a subsequent increasing number of people suffering from dementia are worldwide growing issues. Only in Sweden, 150000 people are diagnosed with dementia and within 30 years that number are expected to be doubled. Somewhat 90% of the patients will experience Behavioral and Psychological Symptoms in Dementia (BPSD), which creates suffering for both patients and relatives. The current project acknowledges these problems and proposes utilization of Evidence-Based Design (EBD), with focus on outdoor environment, to develop the dementia care. Studies indicate benefits of an EBD in healthcare settings and natural environment has been suggested to have positive impact on people suffering from dementia. However, more research is required to convince authorities in concern. Thus, the **AIM** of this project is to explore a potential approach to epidemiological studies including exploration of the effects of outdoor stay and environment on BPSD, and further identifying a method for environment assessment to increase general understanding of the potential of outdoor EBD. The project´s **METHOD** included an exploration of Swedish BPSD registry, a quality registry designed to improve the quality of care of patients with dementia, and outdoor environment assessments based on the Quality Evaluation Tool (QET). On paper, the BPSD registry include over 40 000 patients and somewhat 190 000 separate registrations, counting more than 90 variables including, inter alia, the care measure *outdoor stay* and BPSD frequency and severity. Thus, the registry seems to qualify in larger epidemiological studies. Trying to understand the registry in a context, Falkenberg´s care homes were selected as a *sample*, which in this case imply collecting related data from the BPSD registry and conduct environmental assessment at each care home. The **RESULT** indicates a great variance in BPSD progression, both at individual level and among the different care homes. The BPSD dataset linked to Falkenberg seems to be non-normal distributed, including numerous extreme values. Changes in statistical values like mean and median demonstrate conflicting tendencies when comparing BPSD for groups with and without the variable *outdoor stay*. However, central, i.e. interquartile, values indicate an advantage for the group included in *outdoor stay*. Further, higher level of evidence based environmental qualities in the outdoor could correlate with higher percentage of BPSD improvement. However, it wasn't possible to establish any **CONCLUSIONS** about the BPSD registry´s capability in epidemiological studies linked to outdoor environment. More research is required. Still, the outdoor environment assessment managed to distinguish the care home according to environmental qualities and the result is considered easy to grasp also for laypersons.

Keywords: BPSD registry, BPSD, dementia, dementia care, EBD, outdoor environment, QET

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Table of Contents

1. Introduction

Globally, populations are getting wealthier and poverty are slowly but steady decreasing even in some of the most rural areas. A modern western development, with access to fundamentals like electricity and medications, advance to new countries and raise people's life standard to higher levels (WHO, 2015; World_Bank, 2018). There are numerous of positive sides of such development, still, it also brings new challenges and demands to societies around the world. Among these are aging populations and changing epidemiology (WHO, 2015), such as increasing number of people suffering from dementia (Dua *et al.*, 2017).

Sweden has already undergone many of these changes and episodes which probably many countries stand in front of. Cause it's a fact, people in Sweden are getting older, i.e. life expectancy increases (Folkhälsomyndigheten, 2018), which is a progression since many years (figure 1). Though, in contrast to previous historical periods of life expectancy, the increasing nowadays depends on older people getting older, not due to reduced mortality among children (SCB, 2016). Additionally, an ageing population puts a lot of effort on a country and the communities within it, not at least in economics related to the healthcare systems (Bucht, Bylund and Norlin, 2000).

As mentioned above, dementia is part of a changing epidemiology. To clarify, dementia is a collective designation of various progressive diseases of the brain characterized by impaired cognitive functions (e.g. memory), behavioural changes and difficulties in coping with activities of daily living. Swedish dementia units possess a nationwide quality registry, so called the *BPSD registry*. It contributes to collection of data and monitoring of behavioural and psychological symptoms in dementia (BPSD), using the *Neuro psychiatric inventory* (Cummings *et al.*, 1994).

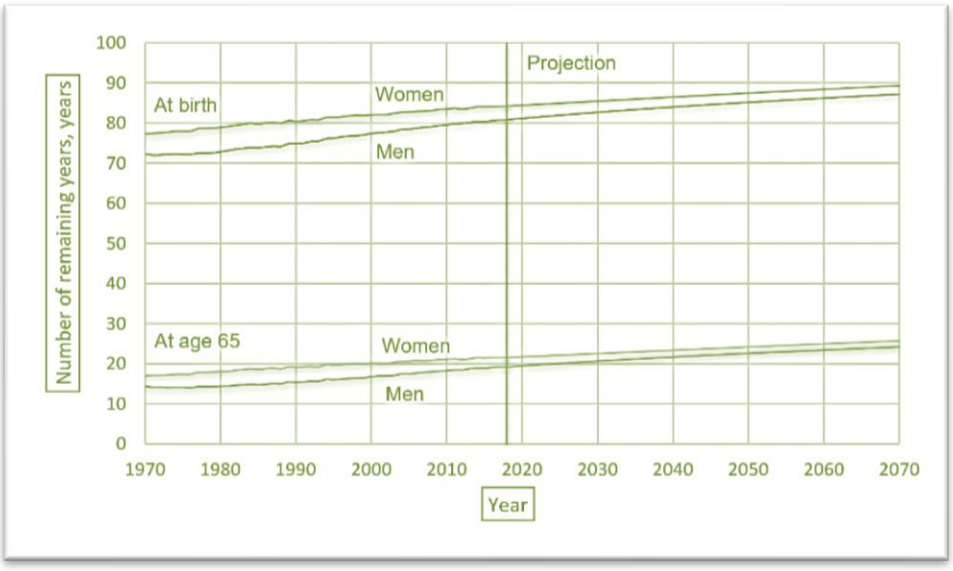

Figure 1. Number of remaining years and projection for women and men, at birth and at 65 years. (SCB, 2018)

Moreover, BPSD are closely related to age and the prevalence of the disease begins to increase from somewhere around the age of 60. Later, the disease doubles within each five-year period from the age of 65 years and forward (figure 2) (Edhag and Norlund, 2006). In other words, higher life expectancy, and more people reaching old age, equals increasing quantity of people suffering from dementia. In numbers, just over 150 000 people are diagnosed with dementia in Sweden and globally that number is somewhat 50 million, a figure that is predicted to increase to 75 million in 2030 and 132 million by 2050 (Dua *et al.*, 2017; Socialstyrelsen, 2014). This overwhelming numbers creates costs, both related to economics, in Sweden estimated to 62,9 billion SEK (2012), but also in personal suffering, both for patient and related parties. In Sweden, the development of the disease is no exception from the rest of the world, and within 30 years the amount of people diagnosed with dementia is expected to be almost twice as high as today (Socialstyrelsen, 2016b). The world is facing a major healthcare challenge and western societies, including Sweden, play a key role to lead and establish sustainable development towards cost effective methods in dementia care.

One way to do this would be to utilize evidence-based design (EBD), which in healthcare settings has been suggested to lower coast and improve health and well-being for both patients and staff (Sadler *et al.*, 2011). Within EBD, nature and outdoor environment has become a natural part and are further proven to be of significance of several health conditions (Grahn and Ottosson, 2010). However, studies that investigate the effects of outdoor environment on dementia disease appears to have low impact on the authorities in concern. For example, possibility to *outdoor stay* are part as a measure of the recommendations for dementia care from the Swedish National Board of Health and Welfare. However, the authority claims the scientific basis for the measure is insufficient (Socialstyrelsen, 2016a). This indicates a low impact capability in established research, a fact which justifies continued efforts and more extensive investigations in the field.

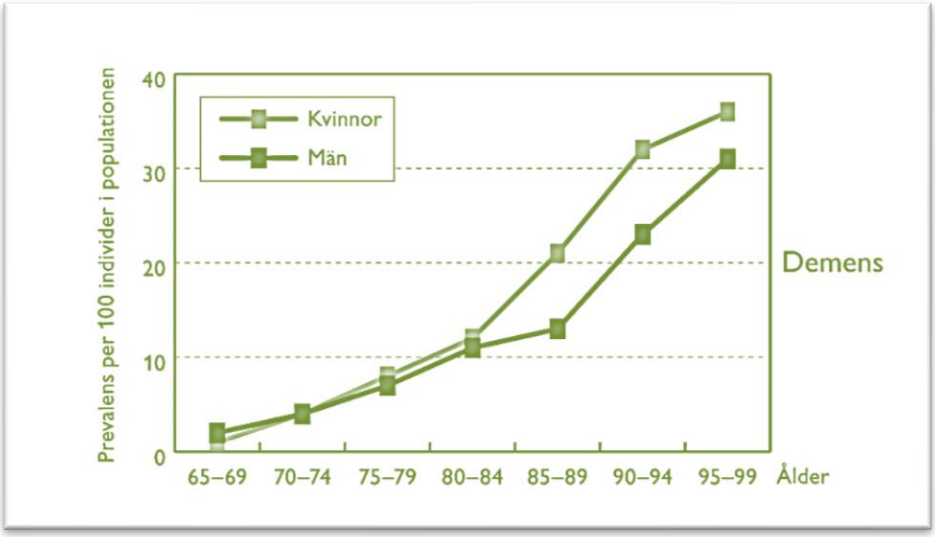

Figure 2. Dementia (demens). Prevalence per 100 individuals in population, Sweden (prevalens per 100 individer i populationen) – women (kvinnor) and men (män) (Edhag and Norlund, 2006).

1.1. Problem definition

Aging populations and associated increase in number of dementia diagnosis are a worldwide growing issue. We need to find effective ways to examine potentially sufficient and rational healthcare measures and designs, to face future healthcare demands. Evidence-based design with focus on outdoor environment might have a potential to improve health and wellbeing among people suffering from dementia. Nevertheless, more extensive research is required to enhance the scientific impact and convince authorities and decisionmakers in concern.

1.2. Aim

I´m going to explore if the data in the so-called Swedish BPSD registry is sufficient to cover for rational and large-scale analyses, aiming at investigating the effects of *outdoor stay* in terms of behavioural and psychological symptoms in dementia (BPSD). Additionally, I want to identify a method that could evaluate outdoor environmental characteristics, and further contribute to an increased general understanding about the relationship between outdoor environment, EBD and BPSD progression (figure 3).

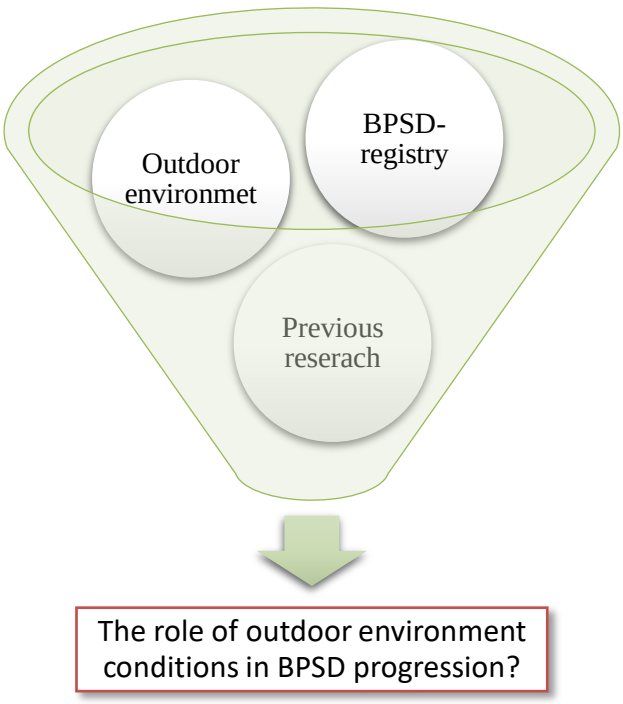

Figure 3. The overall objectives of project fulfilment.

1.3. Theoretical framework

The following chapter describes the theoretical framework of the project. Further, it also includes a literature review and information about the main fundamentals of the project´s general framework.

1.3.1. BPSD and the Swedish BPSD registry

BPSD stands for *behavioural and psychological symptoms in dementia*, which includes a number of symptoms that are predicted to develop among 90% of those suffering from dementia (BPSD, 2019). In turn, dementia is a collective designation of various progressive diseases of the brain characterized by impaired cognitive functions (e.g. memory), behavioural changes and difficulties in coping with activities of daily living. Dementia is highly related to age (Edhag and Norlund, 2006) and BPSD tend to progress over time, following the course of the dementia, even if some symptoms slightly regress in the later phase of the disease (Steinberg *et al.*, 2008). A recent study conducted over a 30-month period at Norway nursing homes demonstrated rather unchanged state for a majority of the examined BPSD, with an exception for a group of agitation sub-syndrome, which increased slowly over time (Helvik *et al.*, 2018).

In the latest years, I have been working within a municipality named Falkenberg as physiotherapist in homecare services. Most of my patients were rather old and a considerable number of them were diagnosed with dementia and living in care homes, both run by the municipality and private companies. To enhance quality of care for patients with dementia in the municipality, the care homes in Falkenberg are obligated to use a quality register, the so called *Swedish BPSD registry*. The registry is nationwide and covers all municipalities in Sweden, both home care services and dementia care homes included.

> "*The register has a clear structure which relies on outlining the frequency and severity of BPSD using the NPI scale (Neuro Psychiatric Inventory), documenting current medical treatment, providing a checklist for possible causes of BPSD and offer evidence-based care plan proposals to reduce BPSD as well as evaluation of the interventions employed"* (BPSD, 2019).

As described, part of the registry structure includes the *Neuro Psychiatric Inventory* (NPI), further adding *Nursing Home Version* (NPI-NH) (Cummings *et al.*, 1994; Wood *et al.*, 2000). This means the registry is collecting data related to BPSD, which include the following symptoms;

1. *Delusions*
2. *Hallucinations*
3. *Agitation/Aggression*
4. *Depression/Dysphoria*
5. *Anxiety*
6. *Elation/Euphoria*
7. *Apathy/Indifference*
8. *Disinhibition*
9. *Irritability/Lability*
10. *Aberrant Motor Behaviour (restlessness)*
11. *Sleep and Night-time Behaviour Disorders*
12. *Appetite and Eating Disorders*

At registration, each symptom is graded according to frequency (1-4) and severity (1-3) or as not present (0). Frequency and severity score are then multiplied, creating the NPI-score for the specific symptom, with minimum score 0 and maximum score 12. All NPI-score for each specific symptom can then be added together and thereby create the total NPI-score for the patient concerned, with minimum score 0 and maximum score 144. According to the Swedish National Board of Health and Welfare (Socialstyrelsen, 2010), follow-up should take place at least once a year. Additionally, the Swedish BPSD register recommends follow up 4-6 weeks after registration (BPSD-registry, 2015)

As described in the citation above, the register helps the user, e.g. the staff at dementia care homes, to determine and analyse symptom from dementia as well as recommending "evidence-based care plan proposals" (BPSD, 2019), i.e. therapy suggestions. Further, it contributes as a tool for evaluation of BPSD progression. Among the therapy suggestions *outdoor stay* is one of the present alternatives, additionally part of the recommendations for dementia care from the Swedish National Board of Health and Welfare (Socialstyrelsen, 2016b). In other words, just like the NPI-score is documented and saved in the registry, so are the care measure *outdoor stay*. Thus, by possessing a dataset from the BPSD registry it could be possible to follow the progression of BPSD and estimate the impact of *outdoor stay*.

1.3.2. Nature and human health

Today, the theory of the natural environment positive impact on human health and wellbeing is scientifically accepted (Bowler *et al.*, 2010), although the knowledge has developed through history. Documentation from thousands of years BC describes gardens as places to gather strength and regain power. The Romans founded their field hospitals in scenic environments to promote rehabilitation, and even Hippocrates drew attention to the healing power of nature (Grahn and Ottosson, 2010). The more recent researcher, Roger Ulrich, made a small but important breakthrough within the modern environmental science which became one of the first contributions to EBD. In his article *View through a Window May Influence Recovery from Surgery,* he found out that patient could recover faster from surgery if they were able to view natural scenery from their hospital window (Ulrich, 1984). The result didn't just prove that nature has a positive impact on human health, it also showed that the effect was gained just through visual stimulus.

1.3.3. Psycho evolutionary theory

Ulrich would go further in his research and combine the idea of human evolution, environmental psychology and the proven restorative effect of nature; a psycho evolutionary theory (PET) was created (Ulrich *et al.*, 1991). A theory which highlight physiological and psychological stress and how certain environmental features can promote restauration and recovery from such stress. Through evolution, humans have evolved systems that make us respond automatically, behaviourally and physiologically, to affects, i.e. feelings/emotions, based on event/features in our surrounding. For example, humans in stress can perceive an increased heartrate and muscle tension. Stress can also manifest as negative emotions and in long term it can lead to agitation, anxiety and fatigue. Though, as well as stressors contribute to initiate our evolutionary evolved affective system, so do environmental ′anti-stressors′, which in this case imply specific natural settings, e.g. water and open vistas, that indicated survival for our ancestors. Because of the relatively high amount of stress recovery setting in nature, the PET suggests an advantage of natural- over urban environment when it comes to restauration. These specific settings, or places, catch our attention and induce moderate interest, pleasantness and calm. Positive emotions emerge and negative feelings are restricted, physiological parameters returns to normal. According to Ulrich, affects prior cognition, in other words; we feel before we think. As a result, stress reactions and stress recovery most likely occur automatically (Nilsson, 2011; Ewert, Mitten and Overholt, 2013).

1.3.4. BPSD and stress

Chronic stress has been proven to increase the risk for various forms of dementia (Greenberg *et al.*, 2014; Johansson *et al.*, 2010), although the link between stress and BPSD is rarely mentioned in present literature. Regardless, it's clear that people diagnosed with dementia perceive stress (Sharp, 2017) and the experience of a progressive disease like dementia probably is perceived as a stressful life event. Thus, theories like PET are to be considered of interest when trying to predict weather or not people diagnosed with dementia can expect any health effects of natural outdoor environments. There are already some indications and it has been suggested that the use of outdoor spaces and elements of nature in the dementia caregiving environment can reduce BPSD, like agitation and aggression (Whall *et al.*, 1997; Whear *et al.*, 2014), but more studies are required to validate the correlation. Horticultural therapy, most often performed in outdoor/natural settings and elements, can positively affect emotional health, perceived self-identity and levels of engagement among people with dementia (Blake and Mitchell, 2016). Likewise, in combination with physical activity, outdoor environment and distraction of natural elements has shown to have restorative effects on anxiety and depression, as well as positive impact on sleep (Uwajeh, Polay and Onosahwo Iyendo, 2018)

1.3.5. Evidence based design

Evidence-based design (EBD) is described as "a process for the conscious, explicit, and judicious use of current best evidence from research and practice in making critical decisions, together with an informed client, about the design of each individual and unique project" (Hamilton and Watkins, 2009). In healthcare settings it has been suggested to increase initial costs but lower them in the long run and investments are estimated to be returned the within a few years (Sadler *et al.*, 2011). More than just saving money, a EBD in different healthcare settings, e.g. at care homes for dementia, could potentially improve patients´ healing processes as well as the wellbeing of patients´ families and staff (Huisman *et al.*, 2012). Additionally, a well-thought-out design is very much a measure that creates a passive support for both patients and staff, in other words, it might reduce a substantial part of the current workload. However, EBD is a rather complex area which involves numerous of design issues, each one requiring its own analysis for good application. One of these design issues is related to natural elements in the outdoors and additionally human contact with such environments, including everything from outdoor gardens to indoor plantings (Sadler *et al.*, 2011; Bengtsson, 2015).

1.3.6. Supportive environment theory

In terms of research, understanding the design of health promoting outdoor environments has come a long way and scientists in Sweden are some of the pioneers in this field. With the framework of the Supportive Environment Theory (SET), Patrik Grahn (Prof. at Swedish University of Agricultural Sciences - SLU) has developed a model which defines different types of human engagement, both passive and active, within diverse natural settings. The model is related to humans' executive functions and is often illustrated as a triangle (figure 4). Further, it explains possible relations to the so called perceived sensory dimensions (PSDs), i.e. the model helps us to understand which environmental qualities that are most important depending on peoples current executive functions and self-perceived well-being (Grahn and Stigsdotter, 2010; Bengtsson and Grahn, 2014). Knowledge which is especially interesting when designing outdoor environment for healthcare proposes.

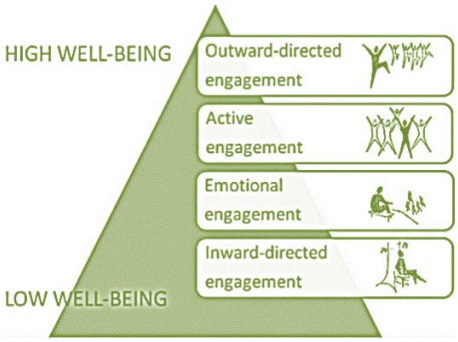

Figure 4. Triangle of supporting environments in relation to stress-related disorders (Bengtsson and Grahn, 2014)

1.3.7. Nineteen evidence-based environmental qualities and 4 zones of contact with the outdoor

At a later stage, Anna Bengtsson (Ph.D., lecturer at Swedish University of Agricultural Sciences – SLU) used the model to describe levels of engagement dimensions in 19 different evidence-based environmental qualities (figure 5). Six of them are connected to a *comfortable environment* (also; *comfortable design*) and the rest are connected to *access to nature and surrounding life* (also; *stimulating design*). In this case, the first six qualities are applicable anywhere along the *gradient of challenge* (figure 5), i.e. they aren't bonded to a certain level of engagement capability and should always be considered. Contrawise, the following thirteen qualities for comfortable design are hierarchic ordered alongside the gradient of challenge (figure 5), thus they have a connection to engagement capability and level of well-being (Bengtsson, 2015; Bengtsson and Grahn, 2014).

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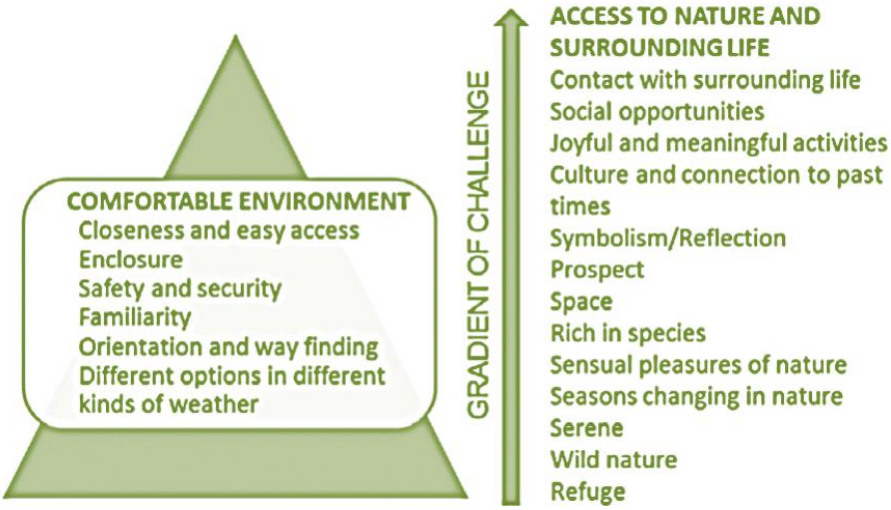


Figure 5. The triangle of supporting environments in relation to 19 evidence-based environmental qualities. Six qualities to support a comfortable environment and thirteen qualities to support access to nature and the surroundings (Bengtsson, 2015)

Bengtsson also developed the principal model of *4 zones of contact with the outdoor* (figure 6), which later was combined with the model of engagement, including the 19 environmental qualities, and altogether they became the Quality Evaluation Tool (QET) (Bengtsson *et al.*, 2018; Bengtsson, 2015). The purpose of the QET is to promote EBD and planning processes for outdoor environments in healthcare setting. As told above, it partly consists of the 19 evidence-based environmental qualities and the principal model of four zones of contact with the outdoor, which is a model describing, as the name suggests, sensuous contact with the outdoor in 4 different zones (Bengtsson, 2015).

The different dimensions and their structural boundaries are as follow;

- **Zone 1** – Indoors. Contact with the outdoor environment through e.g. windows.
- **Zone 2** – Transition zones (between indoors and outdoors), e.g. balconies, patios, conservatories and entrance areas.
- **Zone 3** – The immediate outdoor surrounding, e.g. a park or garden.
- **Zone 4** – The surrounding outside zone 3, e.g. the immediate neighbourhood.

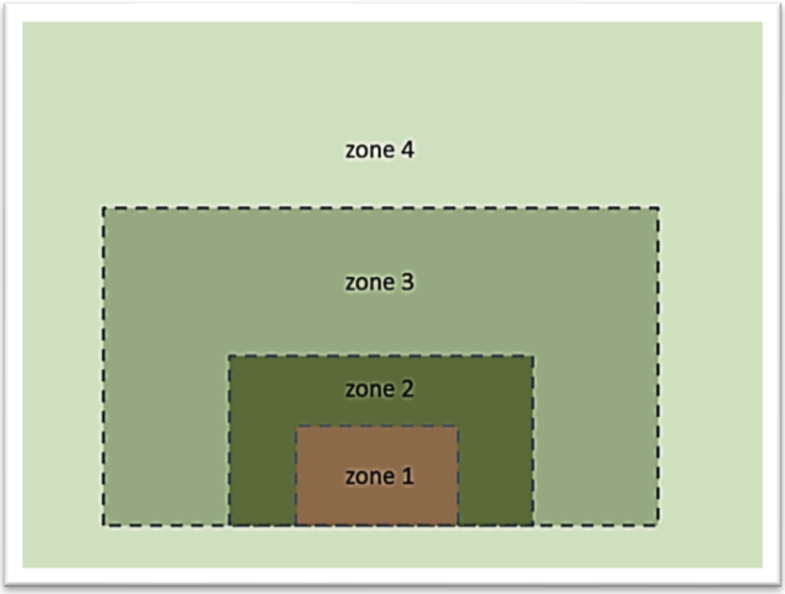


Figure 6. A principal model of four zones of contact with the outdoors in healthcare settings: zone 1, from inside a building; zone 2, transition zone; zone 3, immediate surroundings; and zone 4, the wider neighbourhood

The model represents a rather simple way of observing the environment but gives the user opportunities to break down the concept of human contact with nature and thereby contributes to complex and evidence-based analyses. For instance, if analysing environments that are connected to a dementia care unit, which in turn apply the Swedish BPSD registry, it could be possible to find correlation between the outdoor environment and BPSD progression or frequency of outdoor stay.

2. Method

The following chapter contains and describes methods used to fulfil the project´s purpose as well as ethical considerations. The chapter is divided in three main sections, including the aspects of data collection, data analysis and ethics.

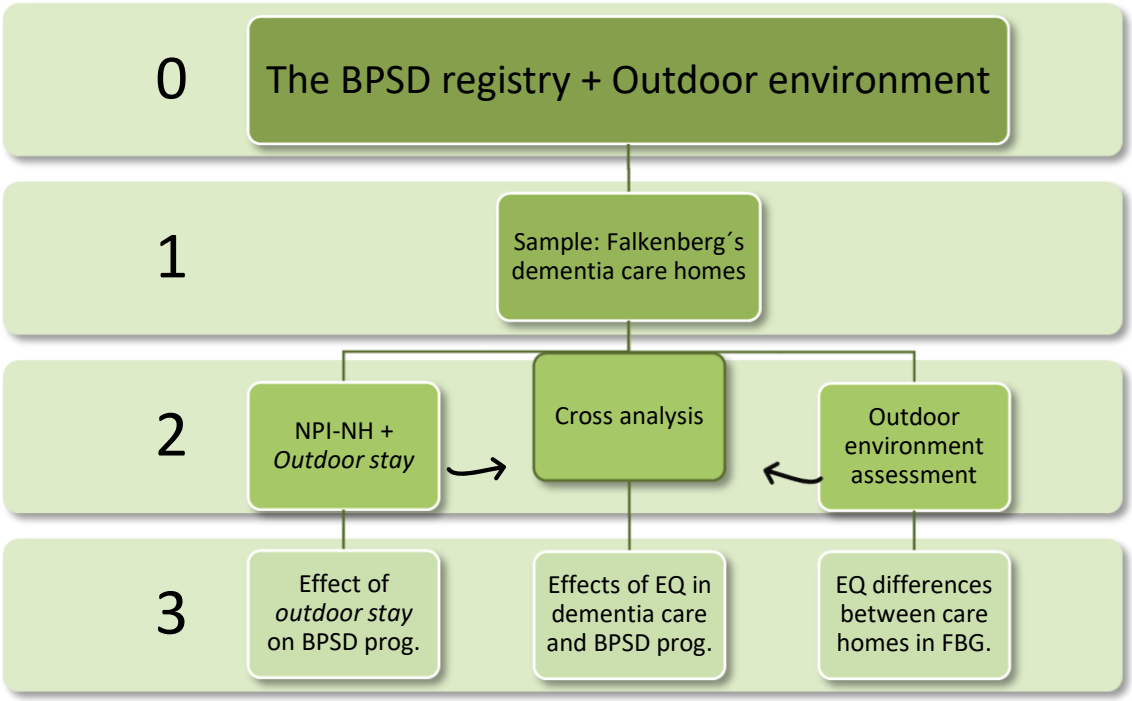


Figure 7. Main structure of project´s method. FBG = Falkenberg, EQ = Environmental qualities, Prog. = progression

The method contains an initial phase and 3 main stages (figure 7), which are suggested to answer for the projects aim. The initial phase, called "0", lies in the periphery of the method and define two features of interest, i.e. the BPSD registry and outdoor environments. These two represent the base of the whole project. In the method´s first stages (1) the project´s samples are defined, both according to the BPSD registry and the outdoor environments of interest. The second stage (2) includes data collection and data analyses, which in this case also involves a cross analysis of processed data from the BPSD registry and the outdoor environment at Falkenberg´s dementia care homes. The last stage (3) consist of the process to interpret the result in accordance with the projects aim and submit final conclusions.

2.1. Data collection and analysis
- Statistics from the Swedish BPSD registry

As described earlier in the section of *Theoretical framework*, the Swedish BPSD registry is a nationwide quality registry and is used within care homes in every municipality in Sweden, in other words, the registry includes a large amount of data. In the case of this specific project, the registry acted as the *population*. According to the project´s aim which, inter alia, includes exploring the registry´s possibilities to evaluate correlation between *outdoor stay* and BPSD progression, I estimated that a *sample* of this population was enough to answer for such issue (figure 8). According to regulations for student´s work, to request data from the central organisation of BPSD-registry, one must either get a written approval from each unit manager or from the head of the social services (*Socialförvaltningen*) for the municipality in concern. Additionally, my residence is in Falkenberg and I have an ongoing communication with representants from the municipality, therefore, a *convenience sampling* in Falkenberg was preferred. Thus, the *sample* came to include the BPSD registry data linked to the municipality´s dementia care home.

Figure 8. Overview, population and sample. "BPSD registry", total registration in the registry. "Dementia care units in Falkenberg", total registrations in the registry in Falkenberg´s municipality.

2.1.1. Population – the Swedish BPSD registry

A comprehensive description of the Swedish BPSD registry can be found in chapter 1 -*Theoretical framework.* The overall features of the population, i.e. the Swedish BPSD registry, are presented in table 1 below.

Table 1. Overall features of the Swedish BPSD registry from 2010 to 2018

The Swedish BPSD registry		
Years in operation:	N (starting year)	9 (2010)
Municipalities included:	N (% of Sweden)	290 (100)
Dementia units included:	N (today active)	≈ 5400 (4200)
Patients included:	N (today alive)	≈ 60 000 (21165)
Registrations included:	N	≈ 190 000

* launched 2010

2.1.2. Sample – dementia care homes in Falkenberg

The sample came to consist of BPSD registry data from 2016 to 2018, including all dementia care home units in Falkenberg. Although they only represent a small sample of the total BPSD registry, they provide comprehensive data for the municipality, i.e. a census, and the results represent the actual situation in the municipality. An overall presentation of the care homes is presented in table 2.

Table 2. Overall presentation of care homes in Falkenberg, which are included in the project.

Care home	*Number of floors*	*Total number of accommodations*	*Number of accommodations in dementia units*	*Driving distance to Falkenberg city centre (km)*	*Perceived area configuration (urban, rural)*
Care home 1.	3	48	48	1,7	Urban
Care home 2.	2	42	10	15,4	Rural/urban
Care home 3.	3	60	20	1	Urban
Care home 4.	2	?	9	0,5	Urban
Care home 5.	1	42	17	32,5	Rural
Care home 6.	3	59	19	3	Urban
Care home 7.	2	51	25 (19+6)	1,5	Rural
Care home 8.	4	80	40	1,2	Rural
Care home 9.	1	31	7	42,3	Rural

The data collection began with contacting the dementia coordinator in Falkenberg, also responsible for the BPSD registry in the municipality, and discuss the overall idea of the project. After giving her support for the project, she in turn passed my request to the BPSD registry department for Research and Development (FoU). They were accommodating and provided me with information about the regulation and processes included when requesting data from the BPSD registry, which included the following;

- Discussion with FoU about the project idea and confirm if the registry´s data can answer the issue of interest.
- Obtain a written approval (see template in appendix) from each care home unit manager or from the head of the social services (Socialförvaltningen).
- Submit an applicational form for data extraction from the BPSD registry, including a list of requested variables.

I decided to ask for a written approval from each care home unit manager, which also gave me the opportunity to meet all of them in person and further present the concept of the project. Additionally, because the meeting took place at the site of each care home, I performed the environmental evaluation at the same occasion. Shortly after completing all the procedures mentioned above, I received the requested dataset, including statistics of BPSD and *outdoor stay*, connected to the nine care homes of interest. The composition of the obtained statistics is part of the project results and can be found in chapter 3.

2.1.3. Data analysis

Initially, I observed the Swedish BPSD registry´s dataset only, i.e. I tried to determine if the dataset itself could cover for analysis's which target to investigate the effects of *outdoor stay* in terms of BPSD. To answer such issue, methods according to below were implemented. Microsoft Excel was used throughout the whole analysis.

1) First, I began with getting familiar with the dataset. I tried to understand its built-up and discover which opportunities that lied within it. To clear that picture, I started to colour certain attributes and variables, e.g. care home units, patients' registrations etc. These type actions helped me to understand the extent of the material and unfolded possible statistical values. Some of the variables in the dataset weren't interesting according to the aim of the project and were sorted out to ease the continued examination.

2) After the initial phase of familiarisation, I continued by expanding the division of the material. By doing this, I could isolate the most core portion of the dataset; statistics of BPSD progression and the care measure *outdoor stay*. For instance, I sorted the patients, i.e. dementia care home residents, according to *outdoor stay*, which created two large groups within the sample, i.e. one which included patients which had been given *outdoor stay* as a care measure and one of patients which hadn't. Further, when the patients were sorted according to their dementia care unit, it was possible to tell differences of both BPSD progression and the frequency of the care measure outdoor stay.

3) When the dataset finally was divided in different groups, I would go deeper into the composition of the variables. For example, each patient could have numerous of registration linked to BPSD and outdoor stay, however, it was also possible to see that the period between registrations differed, which was the case both for the individual patient and among the patients as a group. This means that one patient could have recurrent registrations every third month, while another could have registrations randomly divided over time.

4) Finally, I explored different ways of viewing and describing the data. I used different measures of position and dispersion, as well as graphs and diagrams. Further, these actions helped me to reveal possible correlations and tendencies in and between the variables in the dataset.

Altogether, these steps produced a picture of the data material´s potential, in terms of the project's aim; if the dataset itself could cover for analysis's which target to investigate the effects of *outdoor stay* in terms BPSD. Or, in other words, I was aiming to predict possibilities to draw any conclusions about;

- frequency of the care measure *outdoor stay*,
- treatment results, related to BPSD, of the care measure *outdoor stay*,
- differences, related to the two items above, between the dementia care homes.

2.2. Data collection and analysis - Outdoor environment at dementia care homes

To enable understanding about the outdoors's potential of making an impact on the progression of BPSD, I searched a theoretical approach that allowed a rational evaluation process, producing a result easy to overview for me as well for people outside the university sphere. I decided to use the basics of concept Quality Evaluation Tool (QET) (Bengtsson, 2015), focusing on the 19 environmental qualities and the principal model of 4 zones of contact with the outdoor. I constructed a chart (figure 9) in which I was able to describe and evaluate the care homes' environmental qualities, ranking them in three different colours; green, yellow and red. The procedure was performed for each zone and according to the patients' position (standing/walking, sitting/wheelchair or lying/bedridden). This created a chart, illuminated by colours, in which just a quick glance would help the observer to tell if the environment would meet the qualities (green), or not (red).

2.2.1. Outdoor evaluation chart – dementia care

The chart, which I chose to call *Outdoor evaluation chart – dementia care*, is based on the fundamentals in QET, i.e. the 19 environmental qualities (table 3) and the principal model of 4 zones of contact with the outdoor. The basic concept of the chart is that the user, i.e. the assessor, should be physically located in the zone where the evaluation is being assessed. Furthermore, it´s vital that the assessor is familiar with the user group, both in a behaviour and physiological context. Unfortunately, due to misjudgement in the planning, I wasn't able be at sight when doing the evaluation and had to rely on previous visits and picture from those occasions. Nevertheless, I consider my knowledge and experience as a physiotherapist enough to carry out the evaluation, which I did by following the steps described below.

When filling in the chart, the following steps are to be taken according to the order in the list illustrated bellow;

- At the sight, e.g. the care home, one should begin with getting familiar with the environment, both from the inside and outside of the building, and then define the limits of each zone (box 3, figure 9). At the same time, it´s preferable to construct a basic illustration of the sight according to the 4 zones (box 1, figure 9), which will support the reflective process.

    - **Zone 1** – Indoors. Contact with the outdoor environment through e.g. windows.

- **Zone 2** – Transition zones (between indoors and outdoors), e.g. balconies, patios, conservatories and entrance areas.

- **Zone 3** – The immediate outdoor surrounding, e.g. a park or garden.

- **Zone 4** – The surrounding outside zone 3, e.g. the immediate neighbourhood.

- The next step is to briefly describe the different zones (box 4, figure 9) which, advantageously, can be completed when being located in the zone that are being described. These types of actions will increase awareness of the composition of the environment.

- After describing the zones, the next step is to answer the *yes* and *no* questions (box 8, figure 9). These should be marked as green (YES) or red (NO), alternatively as yellow (YES/NO).

- Now it´s time to evaluate and colour-code (box 2, figure 9) the 19 environmental qualities (box 6, figure 9), whose definitions could be found in table 3 below. Start with the environmental qualities of zone 3 and 4, which are the zones that are in focus during the evaluation. First, one should read the subheading in parentheses (box 5, figure 9) above the comfortable design scales (box 10, figure 9). The subheadings describe how the assessor should observe the environment, and from which location, when performing analysis; e.g. "present qualities in the current zone" (when analysing comfortable design at zone 3 or 4) vs. "From the zone, perceived qualities for zone 3" (when analysing comfortable design at zone 1 or 2). However, one should know that this way of visualization differs from the original QET-tool. The qualities should be visualised from the eyes of the user group, in this case people suffering from dementia, and further the different positions (box 6, figure 9) should be consider. That is, the assessor must imagine the experience of each quality from either standing/walking, sitting/wheelchair or lying/bedridden in every zone and keep in mind the properties for each zone (box 5, figure 9). Each quality is being considered according to the definition in table 3 and colour-coded according to box 2 in figure 9, beginning with the "comfortable design" and then the "stimulating design" (box 6, figure 9).

- When the evaluation of the nineteen environmental qualities for zone 3 and 4 is accomplished, the assessor should continue to zone 1 and 2, using the same procedures. There are exceptions from the original QET-tool definition, which is linked to zone 1 and 2, where the first quality in comfortable design, "Close and easy access", is divided in two aspects; "visibility" and "accessibility" (box 6, figure 9)

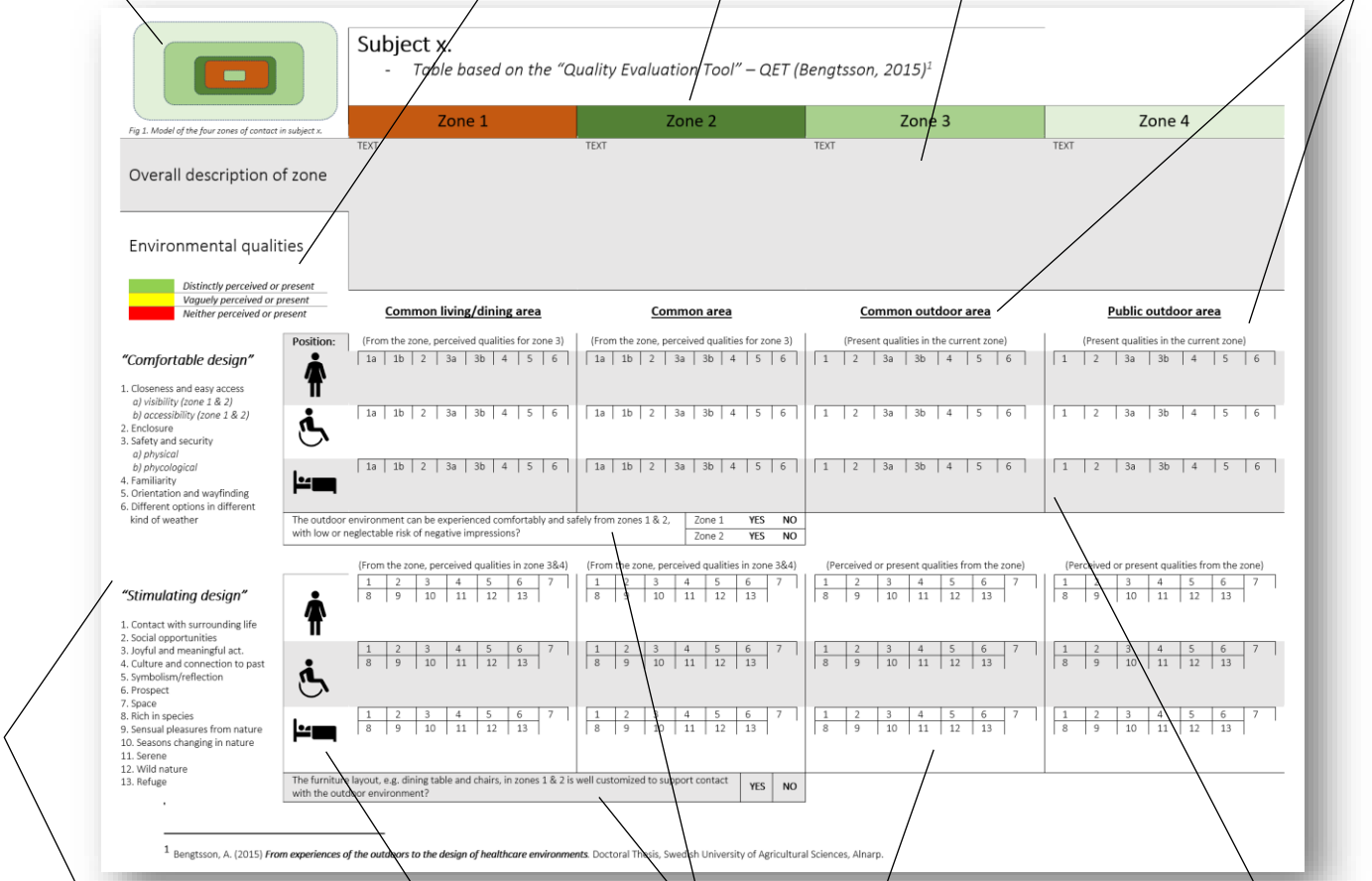
Box 1. Representation of a basic illustration of the care home in concern, based on the principal model of 4 zones of contact with the outdoor.

Box 2. Colour codes; used when estimating how well the environment meets the description of the environmental qualities.

Box 3. Headings for the columns representing the 4 different zones. Colour coded and compatible with the illustration of the 4 zones of contact.

Box 4. Space possible for a shorter overall description of the zone in concern.

Box 5. Headings in bold briefly describing the usage/access to the zone. Subheadings in parentheses describing how the assessor should observe the environment when performing analysis.



Box 6. Lists of the 19 environmental qualities, numbered from 1-6 (*Comfortable design)* and 1-13 (*Stimulating design)*

Box 7. Patient´s position (standing/walking, sitting/wheelchair and lying/bedridden), which the assessor should assume when performing the analysis.

Box 8. Extra questions to highlight the experience of the indoor environment, which to avoid sources of error in the analysis.

Box 9. The 13 environmental qualities connected to stimulating design. Each one should be assessed and ranked in green, yellow or red.

Box 10. The 6 environmental qualities connected to stimulating design. Each one should be assessed and ranked in green, yellow or red.

Figure 9. Brief description of the *Outdoor evaluation chart for dementia care unit*.

Table 3. The nineteen evidence-based environmental qualities of the QET, directly translated from (Bengtsson *et al.*, 2018).

A. Main group 1: Six environmental quality that is about being comfortable in the outdoor environment	B. Main group 2: Thirteen environmental qualities that is about access to nature and life in the outdoor environment
A1. Close and easy access There is a nearby lush outdoor environment (e.g. a garden) for the user group. It is well visible and easy to get to from the building where the user group resides. It is easy to get in and out considering doors, locks, thresholds etc.	**B1. Contact with surrounding life** It is possible to take part of life in the community outside the healthcare facility, e.g. to experience people, animals and traffic.
A2. Enclosure The enclosure of the outdoor environment (hedges, fences, etc.) corresponds to the level of security and safety that the user group needs without, for that reason, being perceived as confining. Some user groups may need escaping routes. Consider whether gates need to be hidden, for example, to protect users with cognitive difficulties that might otherwise get lost or triggered to get out.	**B2. Social opportunities** There are opportunities in the outdoor environment for entertainment and amusement as well as places where you can meet other people. In these places there are plants and other things to talk about. There are seatings that make it easy to meet and socialize outdoors.
A3. Safety and security a) Risks of *physical unpleasantness* in the outdoor environment are very small, e.g. risk of falling or slipping, risks of toxic plants or falling into water. Ground coverings are available regarding width, surfaces, edges and slopes. The distance between benches fits the target group and there are railings to hold where needed. b) The risks of *psychological unpleasantness* in the outdoor environment are very small. The outdoor environment is appealing and intrusive colours, shapes and expressions that can be interpreted negatively are avoided. Consider risks of people crowding in, risks of being viewed by outsiders and risks of interference by those which are staying in the outdoor environment with the people staying indoors and vice versa.	**B3. Joyful and meaningful activities** There are places in the outdoor environment for sedentary activities (such as relaxing, drinking coffee, reading), social activities, physical activities, therapeutic activities and gardening activities. There are walking paths that can be used for exercise as well as for quiet walks. There is the opportunity for visiting children to play and interact with the outdoor environment.
A4. Familiarity The outdoor environment appears as a natural part of the health institution. It is easy to get familiar with the outdoor environment. The features of the outdoor environment, its contents and its possibilities for different activities are familiar and easy to grasp for the users. People staying in the outdoor environment are well known to the user group.	**B4. Culture and connection to past times** There are places in the outdoor environment that give the opportunity to be fascinated with human culture and values. There are items that stimulate the memory such as a washing line, a *rickepump* or a barbecue area. Plants and elements in the outdoor environment give the place its own character and meaning and something to be proud of.
A5. Orientability Configuration and design of pathways, places, landmarks, nodes and edges is clear and helps the user group understand and be able to orient themselves in the outdoor environment. For people with difficulties in orienting themselves, it is important, for example, that pathways don't lead to dead ends and that a variety of places along the pathway provide opportunities for different experiences and activities. The entrance into the building is an important landmark that should be visible throughout the garden. The boundaries between private and public places are clear.	**B5. Symbolism/Reflection** There are elements in the outdoor environment that can give rise to symbolism and metaphors between one's own life and nature. The experience of timelessness near of a large moss-covered stone is an example. Consideration is for example. that in some situations greenery and lushness can be perceived to be too intrusive. ("Yes, sure it hurts when buds burst" Karin Boye).
A6. Different possibilities in different weather Walkways and seating are placed so that there is the opportunity to get sun, shade, wind shelters and rain cover.	**B6. Prospect** There are inviting open green areas with a view of nature and plants.
	B7. Space There are areas that give a feeling of entering an undisturbed world, with a sense of coherent whole, for example. as in a beech forest.

B8. Rich in species

There are areas in the outdoor environment with biodiversity in terms of plants and/or animals that give varying expressions of life. (Intense intrusive expressions and greenery can have a major impact on sensitive individuals).

B9. Sensual pleasures of nature

There are opportunities in the outdoor environment to see, feel, hear, smell and taste what nature have to offers, e.g. trees, plants, flowers, fruits, animals and insects. There is the opportunity for nature experiences of sun, sky, wind, water, sunrise and sunset.

B10. Seasonal changing in nature

There is the opportunity to follow the year's changes in nature, partly by our senses but also through experiences and activities in the outdoor environment. Such gives clues to people who have difficulty orienting themselves in time and space.

B11. Serene

There are quiet places in the outdoor environment that are neither overcrowded nor have disturbing features. Well-kept areas with calming elements of water and/or greenery offer relaxation, peace and quiet. The sound of water is particularly calming.

B12. Wild nature

There is the opportunity to experience nature on its own terms. There are areas where plants seem to have come to grow by themselves and where they can develop freely.

B13. Refuge

There are surrounded and secluded green spaces in the outdoor environment where you undisturbed can do what you want, be left alone, have private discussions or just observe people from a distance. There are special outdoor spaces for staff breaks.

2.2.2. Data analysis – BPSD statistics and environmental evaluation

This section includes a cross analysis of the collected data from the outdoor environmental evaluation, described in section above, and the processed data material from the Swedish BPSD registry. As mentioned, I used the *Outdoor evaluation chart – dementia care*, based on the QET-tool, to visualize the care homes overall capability to meet the nineteen environmental qualities. In other words, I was able to compare the dementia units in terms of their outdoor environment and, if the dataset in BPSD registry would allow, potentially create good conditions for increased understanding of the relation between outdoor environment and BPSD. That is, by combining the two datasets, I was trying to predict tendencies and correlations related to the care homes´ outdoor environment and BPSD progression.

The analysing procedure consisted of a qualitative approach where I compared the nine different care homes´ outdoor evaluations and tried to understand if the evaluation results could serve as a marker for BPSD progression and level of utilization of care measure *outdoor stay*. In other words, I used the processed dataset from the Swedish BPSD registry and compared it with the environmental score, from the *Outdoor evaluation chart – dementia care,* and searched for patterns between the two datasets.

2.3. Ethical considerations

The BPSD registry contains sensitive personal data, e.g. patient data at individual level protected by Swedish law (Patientdatalag (2008:355)). To be able to collect data from the register one must either attend a research project with ethical approval by the Swedish Ethics Review Authority, alternatively, conduct a quality- or student project which aren´t subject for scientific publication or doctoral dissertation (Görman, 2013; BPSD-registry, 2018). This specific project is an independent project in landscape architecture at master´s level and aren´t included in any doctoral studies, thus is doesn´t require any approval by the Swedish Ethics Review Authority. Though, this doesn´t make the data less sensitive and it must always be handled with great caution.

One should always pay attention to the balance of interest, or in other words, estimate risk and gain. There are different kind of interest, including interest of knowledge (the research criterion), interest in integrity and interest in not harm or risk of harm (the criterion of protection of the individual). To improve the protection of the patient's integrity and minimize the risk of harm, the data collected from the BPSD-registry was encrypted and patients' identities remained unknown to me and others involved in the project. Also, the presentation in the final report never included data at individual level but contained only compilations of data at group level, e.g. divided in dementia care homes. Though, to be able to compare BPSD progression between different care home units, the patient data had to be divided by care home units. After all, in this case the gain was assumed to outweight the risk.

The regulations for the BPSD-registry tells that the healthcare unit, e.g. a dementia care home, which register the data also owns the data. Thus, to be able to collect data from the central organisation of BPSD-registry, one must either get a written approval from each unit manager or from the head of the social services (Socialförvaltningen) for the municipality in concern. In this case, the written approval (see appendix) contained information about purposes of which the data were going to be handled, furthermore, a verbal presentation of the project was conducted. This allowed the care home mangers to ask questions and improve understanding of the project, i.e. they become informed about associated risk and gain of disclosing the data. Further, the managers were informed that the participation was voluntary and that they were able to withdraw at any moment.

Investigating the possibility and further collecting the data from the BPSD registry, as described above, became one of the first step in this project. When being in possession of- and working with the data, i.e. when conducting the examination, once again the data must be handled with great respect. During the whole working process, the data were only available for those involved in this specific project, i.e. protected from unauthorized.

The project design also included collection of environmental data, i.e. visiting the care homes in concern. To facilitate the working process and avoid bias, the visits and environmental descriptions was conducted before analysing the BPSD data material. Further, visiting the care homes implied taking pictures of both inside and outside environment. Before taking picture, permission was requested from the manager and the picture would never include people, i.e. patients or staff. If taking picture inside private apartment, the manager asked for permission from the patient in concern. Caution was taken to avoid that portrait, like family pictures, or personal belongings would end up in the pictures taken and then compromise the patient's integrity.

Overall, I put effort in honesty, to tell the truth about research and findings. I aim to request no more information than necessary and carefully document my process of work to fulfil transparency.

3. Result

The following chapter contains and describes the results linked to the analysis of the Swedish BPSD registry and the dementia care homes in Falkenberg.

3.1. Statistics in the Swedish BPSD registry

The variables illustrated in table 4 below provide a picture of the capacity of the Swedish BPSD registry. When requesting data, a total number of 91 variables were possible to choose from, whereas 37 were linked to NPI-NH, i.e. BPSD, and 2 were linked to the care measure *outdoor stay*. The extracted values of the variables come from the patients´ individual registration in the registry, assessed by the care home staff and medical personnel in concern. In addition, *free text* data files linked to care measures, e.g. *outdoor stay* (MSR_OUTDOORS in table 4.) are possible to extract.

Table 4. Variables possible to request from the Swedish BPSD registry.

Code (variable)	Explanation	Measure / range
ASSESSMENTID	The unique ID number of the specific assessment	Unique number
AGE	Person´s age	Years
GENDER	Person´s gender	Male/female
DEMENTIADIAGNOSIS	E.g. Alzheimer's, late onset, Vascular dementia etc.	Diagnosis, ink. number
CAREHOME (NR)	The unique number of the dementia unit	Unique number
PERSONALCODE	The unique number for each individual. Makes it possible to track the registrations over time for each patient.	Unique number
DAYSFROMCONTROL	Days from last assessment	Days
REGISTERDATE	Date of registration	Date
MSR_FOOD	Does the person get enough of food?	Y=Yes / N=no
MSR_FLUIDS	Does the person get enough of beverage?	Y=Yes / N=no
MSR_SLEEP	Does the person get enough of sleep?	Y=Yes / N=no
MSR_URINE	Urine, normal?	Y=Yes / N=no
MSR_SIGHT	Sight, normal?	Y=Yes / N=no
MSR_HEARING	Hearing, normal	Y=Yes / N=no
MSR_PAIN	Does the person appear free of pain?	Y=Yes / N=no
MSR_COOPERATION	Is there daily positive interaction?	Y=Yes / N=no
MSR_TEMP	The person's body temperature?	N=normal / O=abnormal
MSR_PULSE	The person´s heart rate?	N=normal / O=abnormal
MSR_BLOODPREASURE	The person's blood pressure?	N=normal / L=low / H=high O=orthostatic
MSR_BREATHING	The person´s breathing?	N=normal / O=abnormal
MSR_BLOODSUGAR	The person´s blood sugar?	N=normal / L=low / H=high
MSR_URINETEST	The person´s urine?	N=normal / O=abnormal
MSR_DOCTOR	Pharmaceutical review completed?	Y=Yes / N=no
MSR_FAECES	The person´s faeces?	N=normal / O=abnormal

Table 4. Variables possible to request from the Swedish BPSD registry.

Code (variable)	Explanation	Measure / range
MSR_NEXTMEASUREMENT	Date of next assessment/registration	Date
MSR_ACTIVATION	Activation	Yes / No
MSR_PERWEEK	Occasions of activation	Number (1-…)/week
MSR_PHYSICALACTIVITY	Physical activity	Yes / No
MSR_PHYSICALACTIVI-TYPERWEEK	Occasions of physical activity	Number (1-…)/week
MSR_CALMENVIRONMENT	Calming sound environment	Yes / No
MSR_MASSAGE	Massage	Yes / No
MSR_MASSAGEPERWEEK	Occasions of massage	Number (1-…)/week
MSR_MUSIC	Music	Yes / No
MSR_MUSICPERWEEK	Occasion of music	C
MSR_EXTRASUPPORTMEALS	Extra support at meals	Y=Yes / N=no
MSR_EXTRASUPPORTANXIETY	Extra support in case of anxiety	Y=Yes / N=no
MSR_EXTRASUPPORTOTHER	Other extra support	Yes / No
MSR_OUTDOORS	Outdoor stay	Yes / No
MSR_OUTDOORSPERWEEK	Occasion of outdoor stay	Number (1-…)/week
MSR_OTHERACTIVITY	Other activities	Yes / No
MSR_CAREPLAN	Is there an established care plan for the person?	Yes / No
MSR_APPROVED	Is the registration/assessment signed/approved?	Y=Yes / N=no
MSR_APPROVEDDATE	Date of signed/approved	*
A11+A12	Vitamins and minerals	*
N02	Analgesics	*
N03	Antiepileptic drugs	*
N04	Parkinsonism medicine	*
N05A	Antipsychotics	*
NO5B	Tranquilizer	*
N05C	Sleeping pills	*
N06A	Antidepressants	*
N06DA	Cholinesterase inhibitors	*
N06DX	NMDA-antagonist	*
N	Other medicines	*

(NPI-NH)	(BPSD)	(SCORING SYSTEM)
MSR_Q1FREQUENCY	Delusions, frequency	0-4
MSR_Q1SEVERITY	Delusions, severity	0-3
MSR_Q1TOTAL	Delusions total score (product of frequency and severity score)	0-12
MSR_Q2FREQUENCY	Hallucinations, frequency	0-4
MSR_Q2SEVERITY	Hallucinations, severity	0-3
MSR_Q2TOTAL	Hallucinations, total score	0-12
MSR_Q3FREQUENCY	Agitation, frequency	0-4
MSR_Q3SEVERITY	Agitation, severity	0-3
MSR_Q3TOTAL	Agitation, total score	0-12
MSR_Q4FREQUENCY	Depression, frequency	0-4
MSR_Q4SEVERITY	Depression, severity	0-3
MSR_Q4TOTAL	Depression, total score	0-12
MSR_Q5FREQUENCY	Anxiety, frequency	0-4
MSR_Q5SEVERITY	Anxiety, severity	0-3
MSR_Q5TOTAL	Anxiety, total score	0-12
MSR_Q6FREQUENCY	Euphoria, frequency	0-4
MSR_Q6SEVERITY	Euphoria, severity	0-3
MSR_Q6TOTAL	Euphoria, total score	0-12
MSR_Q7FREQUENCY	Apathy, frequency	0-4
MSR_Q7SEVERITY	Apathy, severity	0-3
MSR_Q7TOTAL	Apathy, total score	0-12
MSR_Q8FREQUENCY	Disinhibition, frequency	0-4
MSR_Q8SEVERITY	Disinhibition, severity	0-3
MSR_Q8TOTAL	Disinhibition, total score	0-12

Table 4. Variables possible to request from the Swedish BPSD registry.

(NPI-NH)	(BPSD)	(SCORING SYSTEM)
MSR_Q9FREQUENCY	Irritability, frequency	0-4
MSR_Q9SEVERITY	Irritability, severity	0-3
MSR_Q9TOTAL	Irritability, total score	0-12
MSR_Q10FREQUENCY	Aberrant Motor Behaviour, frequency	0-4
MSR_Q10SEVERITY	Aberrant Motor Behaviour, severity	0-3
MSR_Q10TOTAL	Aberrant Motor Behaviour, total score	0-12
MSR_Q11FREQUENCY	Sleeping disorders, frequency	0-4
MSR_Q11SEVERITY	Sleeping disorders, severity	0-3
MSR_Q11TOTAL	Sleeping disorders, total score	0-12
MSR_Q12SEVERITY	Appetite, frequency	0-4
MSR_Q12FREQUENCY	Appetite, severity	0-3
MSR_Q12TOTAL	Appetite, total score	0-12
MSR_TOTAL	Sum score of all domain in NPI-NH	0-144

* unknown measure /range

3.1.1. Variables of certain interest according to BPSD progression and outdoor environment

The result presented in table 5 bellow illustrate an assortment of the total amount of variables in the BPSD registry. These form an assembly of variables which are considered interesting related to BPSD progression and outdoor environment and are further in accordance with the project´s aim. In following analysis in next section, the sum score of BPSD (MSR_TOTAL) and the care measure *outdoor stay* (MSR_OUTDOORS) will be in focus.

Table 5. Variables estimated to be of certain interest in terms of BPSD progression and outdoor environment.

Code (variable)	Explanation	Measure / range
AGE	Person´s age	Years
DEMENTIADIAGNOSIS	E.g. Alzheimer's, late onset, Vascular dementia etc.	Diagnosis, ink. number
CAREHOME	The unique number of the dementia unit	Unique number
PERSONALCODE	The unique number for each individual. Makes it possible to track the registrations over time for each patient.	Unique number
REGISTERDATE	Date of registration	Date
MSR_SIGHT	Sight, normal?	Y=Yes / N=no
MSR_HEARING	Hearing, normal?	Y=Yes / N=no
MSR_OUTDOORS	Outdoor stay	Yes / No
MSR_OUTDOORSPERWEEK	Occasions of outdoor stay	Number (1-…)/week

(NPI-NH)	(BPSD)	(SCORING SYSTEM)
MSR_Q1FREQUENCY	Delusions, frequency	0-4
MSR_Q1SEVERITY	Delusions, severity	0-3
MSR_Q1TOTAL	Delusions total score	0-12 (frequency x severity)
MSR_Q2FREQUENCY	Hallucinations, frequency	0-4
MSR_Q2SEVERITY	Hallucinations, severity	0-3
MSR_Q2TOTAL	Hallucinations, total score	0-12 (frequency x severity)
MSR_Q3FREQUENCY	Agitation, frequency	0-4
MSR_Q3SEVERITY	Agitation, severity	0-3

Table 5. Variables estimated to be of certain interest in terms of BPSD progression and outdoor environment.

(NPI-NH)	(BPSD)	(SCORING SYSTEM)
MSR_Q3TOTAL	Agitation, total score	0-12 (frequency x severity)
MSR_Q4FREQUENCY	Depression, frequency	0-4
MSR_Q4SEVERITY	Depression, severity	0-3
MSR_Q4TOTAL	Depression, total score	0-12 (frequency x severity)
MSR_Q5FREQUENCY	Anxiety, frequency	0-4
MSR_Q5SEVERITY	Anxiety, severity	0-3
MSR_Q5TOTAL	Anxiety, total score	0-12 (frequency x severity)
MSR_Q6FREQUENCY	Euphoria, frequency	0-4
MSR_Q6SEVERITY	Euphoria, severity	0-3
MSR_Q6TOTAL	Euphoria, total score	0-12 (frequency x severity)
MSR_Q7FREQUENCY	Apathy, frequency	0-4
MSR_Q7SEVERITY	Apathy, severity	0-3
MSR_Q7TOTAL	Apathy, total score	0-12 (frequency x severity)
MSR_Q8FREQUENCY	Disinhibition, frequency	0-4
MSR_Q8SEVERITY	Disinhibition, severity	0-3
MSR_Q8TOTAL	Disinhibition, total score	0-12 (frequency x severity)
MSR_Q9FREQUENCY	Irritability, frequency	0-4
MSR_Q9SEVERITY	Irritability, severity	0-3
MSR_Q9TOTAL	Irritability, total score	0-12 (frequency x severity)
MSR_Q10FREQUENCY	Aberrant Motor Behaviour, frequency	0-4
MSR_Q10SEVERITY	Aberrant Motor Behaviour, severity	0-3
MSR_Q10TOTAL	Aberrant Motor Behaviour, total score	0-12 (frequency x severity)
MSR_Q11FREQUENCY	Sleeping disorders, frequency	0-4
MSR_Q11SEVERITY	Sleeping disorders, severity	0-3
MSR_Q11TOTAL	Sleeping disorders, total score	0-12 (frequency x severity)
MSR_Q12SEVERITY	Appetite, frequency	0-4
MSR_Q12FREQUENCY	Appetite, severity	0-3
MSR_Q12TOTAL	Appetite, total score	0-12 (frequency x severity)
MSR_TOTAL	Sum score of all domain in NPI-NH	0-144

3.1.2. Falkenberg`s care homes in the Swedish BPSD registry

The following section describes characteristics, according to the BPSD registry, of Falkenberg´s dementia care homes (Table 6). The data is extracted from the beginning of 2016 till the end of 2018, i.e. two years. Altogether, the municipality has nine different care homes distributed from the cost in the west to the woodland in the east. In the care homes, the most common dementia diagnosis is vascular dementia (29.5%). In total, 275 patients in Falkenberg possess at least one registration in the registry and 63% of them are female. The number of patients decrease to 179 and 92 when including only those with more than two respectively three registrations. The time-gap between registrations are on average 11 respectively 15 months, but the gap varies greatly from patient to patient. Including all patients´ first registration, the mean of the sum score of BPSD (MSR_TOTAL) is 18,1 although the SD are high (18,18). Totally, 68% of the patients are subject for the care measure *outdoor stay* (MSR_OUTDOORS), given an average of 3,3 days à week.

Table 6. The characteristics of Falkenberg´s care home in the Swedish BPSD registry

Distribution of dementia diagnosis, all care homes included		
Alzheimer's, early onset:	N (%)	15 (5,5)
Alzheimer's, late onset:	N (%)	49 (17,8)
Vascular dementia:	N (%)	81 (29,5)
Comb., Alzheimer's + Vascular dementia:	N (%)	17 (6,2)
Lewy body dementia:	N (%)	2 (0,7)
Frontal lobe dementia:	N (%)	6 (2,2)
Parkinson with dementia:	N (%)	2 (0,7)
Dementia UNS:	N (%)	27 (9,8)
Other dementia diagnoses:	N (%)	46 (16,7)
Dementia diagnose missing:	N (%)	30 (10,9)
Registrations characteristics, all registrations included		
Female:	N (%)	173 (63)
Male:	N (%)	102 (37)
Total, patients:	N	275
Total, registrations	N	667
First registration, MSR_TOTAL:	Mean (SD)	18,05 (18,2)
	Median (IQR)	13 (23)
Patient included in MSR_OUTDOORS:	N (%)	186 (68)
Registrations of MSR_OUTDOORS:	N	361
Registrations of MSR_OUTDOORSPERWEEK	Mean (SD)	3,3 (2,0)
Registrations characteristics, 2 or more registrations per patient included		
Female:	N (%)	115 (64)
Male:	N (%)	64 (36)
Patients:	N (%)	179 (65*)
Registrations:	N (%)	568 (85*)
First registration, MSR_TOTAL:	Mean (SD)	25,22 (21,3)
	Median (IQR)	22 (31,5)
Last registration, MSR_TOTAL:	Mean (SD)	20,6 (19,0)
	Median (IQR)	15 (26)
Month between first/last reg., MSR_TOTAL:	Mean (SD)	11 (7)
Patient included in MSR_OUTDOORS:	N (%)	133 (74)
Registrations of MSR_OUTDOORS:	N	313
Registrations of MSR_OUTDOORSPERWEEK	Mean (SD)	3,3 (2)
Registrations characteristics, 3 or more registrations per patient included		
Female:	N (%)	61 (66)
Male:	N (%)	31 (34)
Patients:	N (%)	92 (33*)
Registrations:	N (%)	392 (59*)
First registration, MSR_TOTAL:	Mean (SD)	31,75 (22,2)
	Median (IQR)	29 (30,8)
Last registration, MSR_TOTAL:	Mean (SD)	23,65 (19,1)
	Median (IQR)	20 (25,5)
Month between firs/last reg., MSR_TOTAL:	Mean (SD)	15 (7)
Patient included in MSR_OUTDOORS:	N (%)	68 (74)
Registrations of MSR_OUTDOORS:	N	218
Registrations of MSR_OUTDOORSPERWEEK	Mean (SD)	3,4 (2)

* % of total related data in registry representing Falkenberg´s care homes

3.1.3. Course of BPSD and *Outdoor stay* in Falkenberg´s care homes

The following section contains descriptive statistics related to the sum score of BPSD (MSR_TOTAL) and the care measure *outdoor stay* (MSR_OUTDOORS), which are presented in multiple diagrams illustrated in figures 10-20 bellow. The section is divided in four subsections, highlighting some of the data characteristics.

The first subsection, 3.1.3.1., displays the data in a boxplot diagram (figure 10) divided in three sections, including (1) registrations from patients which haven't been subjects for the care measure *outdoor stay,* (2) registration from all patients and (3) registrations from patients which have been subject for *outdoor stay*. The three section only include registrations linked to patients with at least two registrations in the BPSD registry. Each section includes two boxplots, one showing the sum score of BPSD at first registration, and one at the last registration. Mean values are marked by *x* and median values are illustrated by a line in the central box. The last two sections include outliers, which are illustrated as small dots. First section includes registrations from 38 patients, second section 179 and last section 133.

The second subsection, 3.1.3.2., displays data distribution related to patients with more than two registrations in the BPSD registry. Figure 11 and 13 reveal the positively skewed distributed data of first and last registrations of sum score of BPSD. Figure 12 illustrates rather normal distributed data, which consists of each patient´s individual change in sum score of BPSD, from first to last registration.

The third subsection, 3.1.3.3., contains four different bar charts (figure 14-17), illustrating the relation between the mean- and median values of change between first and last registration of the sum score of BPSD, referring only to patients with more than two registrations. In each bar chart, changes in three groups are displayed; (1) registrations from patient which haven't been subject for the care measure *outdoor stay,* (2) registration from all patients and (3) registrations from patient which have been subject for *outdoor stay*. In figure 16 and 17, the mean and median change are based on all available registrations. In figure 14 and 15, the mean and median change are based on registrations from patients which got better, i.e. had fewer BPSD at the last registration. The characteristics of the two pair of datasets are the same, i.e. the changes of mean- and median value points at different directions. However, the datasets are different in as much the trend of the mean- and median value changes are the opposite in the different cases.

The last section, 3.1.3.4., displays two bar charts including the trends of interquartile mean, i.e. trimmed mean of the interquartile range, and interquartile median changes of sum score of BPSD, from first and last registration. Otherwise, the same conditions as in the third subsection are applied. However, in this case the trend of mean- and median value are the same (figure 19 and 20). This indicates an advantage for the patients which has been subject for *outdoor stay,* i.e. the group appear to have the greatest reduction of BPSD from first to last registration. Moreover, the current section also includes a diagram of distribution of the interquartile changes from first to last registration (figure 18).

3.1.3.1. Distribution of BPSD (MSR_TOTAL) at first and last registration, including *Outdoor stay* (MSR_OUTDOORS)

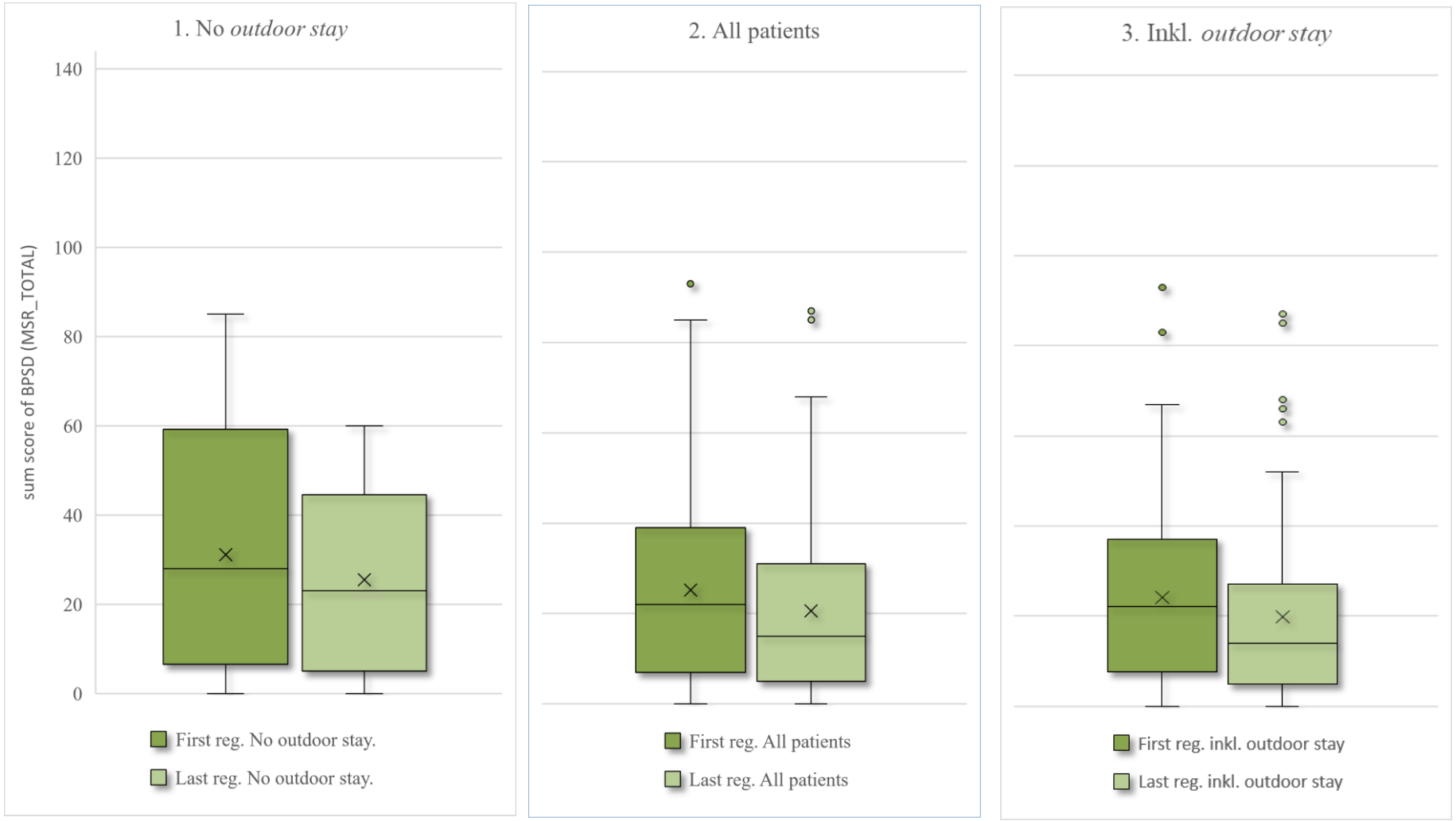


Figure 10. BPSD sum score (MSR_TOTAL), first and last registration – minimum of two registrations. (1) Patient without *outdoor stay* (MSR_OUTDOORS), (2) all patients and (3) patients with *outdoor stay*.

3.1.3.2. Distribution of BPSD sum score (MSR_TOTAL) and changes of BPSD from first to last registration

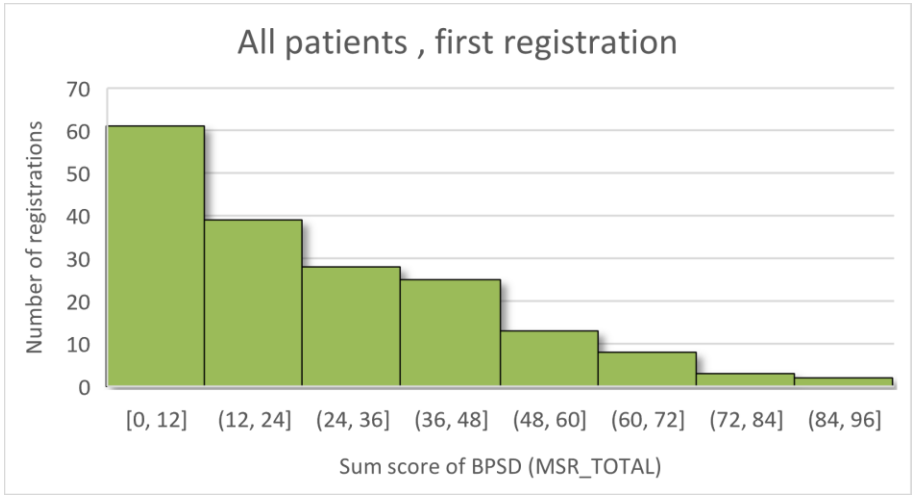


Figure 11. Distribution of BPSD sum score (MSR_TOTAL), first registration. Minimum two registrations.

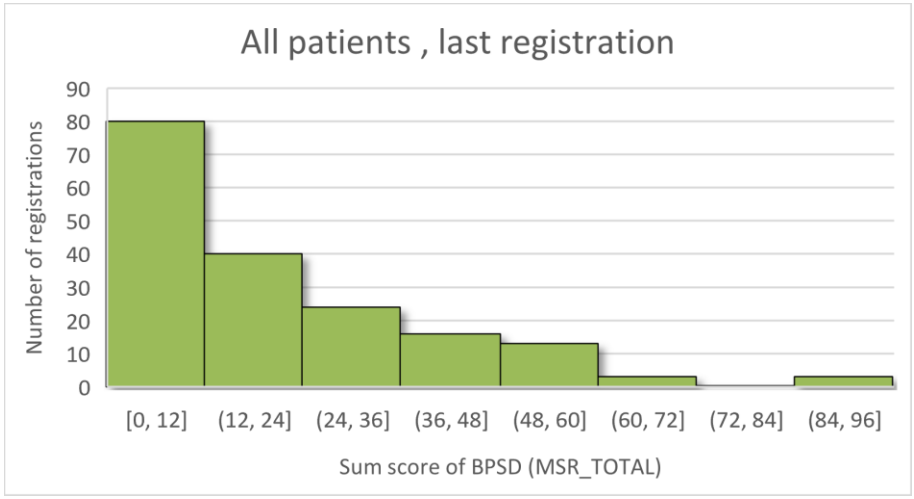


Figure 13. Distribution of BPSD sum score (MSR_TOTAL), last registration. Minimum two registrations.

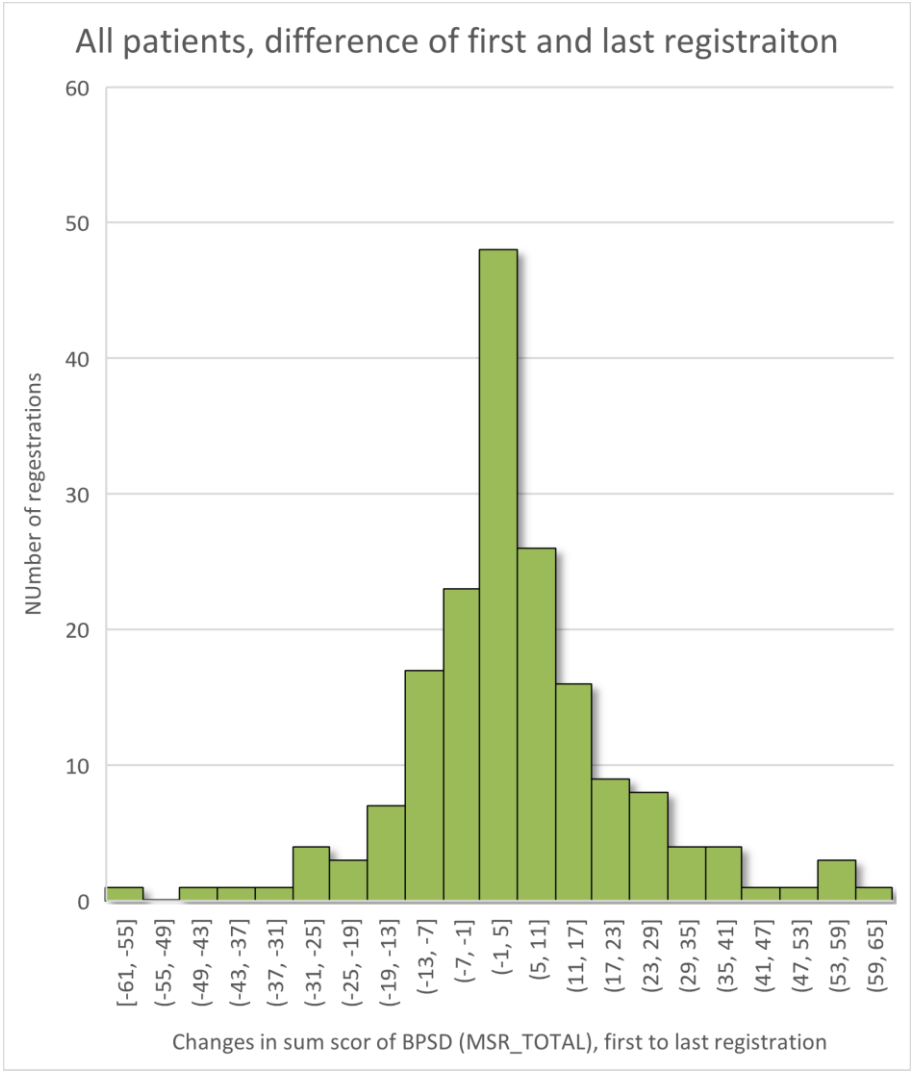


Figure 12. Distribution of change in BPSD sum score (MSR_TOTAL), first and last registration. Minimum two registrations.

3.1.3.3. Comparation of mean and median change of BPSD sum score (MSR_TOTAL) from first to last registration

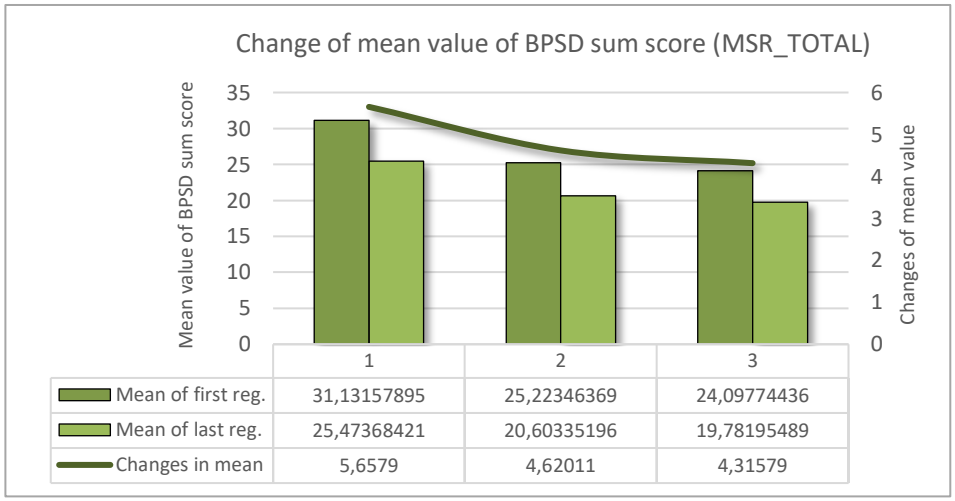


Figure 17. Change of mean value in sum score of BPSD (MSR_TOTAL), including all first and last registrations (minimum two reg.). Including 3 groups; (1) no *outdoor stay*, (2) all patients and (3) incl. *outdoor stay*.

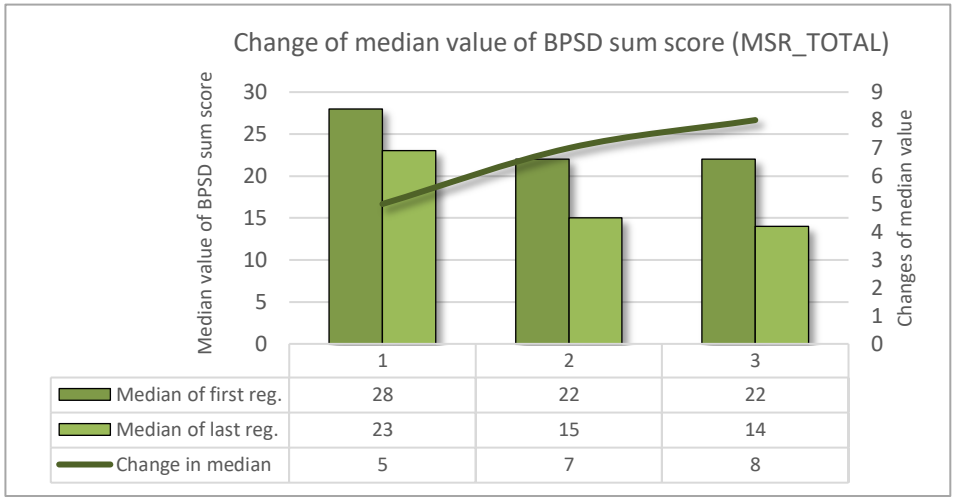


Figure 16. Change of median value in sum score of BPSD (MSR_TOTAL), including all first and last registrations (minimum two reg.). Including 3 groups; (1) *no outdoor stay*, (2) all patients and (3) incl. *outdoor stay*.

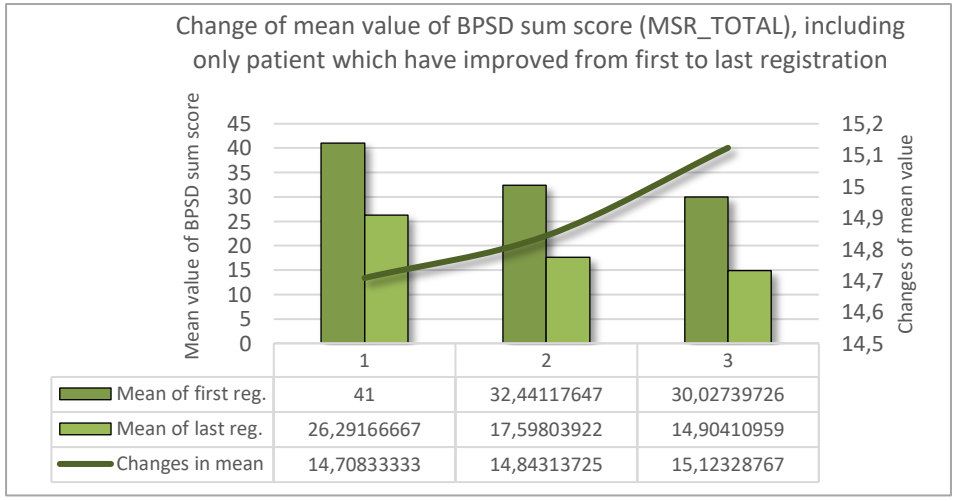


Figure 15. Change in mean value in sum score of BPSD (MSR_TOTAL), including first and last improving registrations (minimum two reg.) Including 3 groups; (1) no *outdoor stay*, (2) all patients and (3) incl. *outdoor stay*.

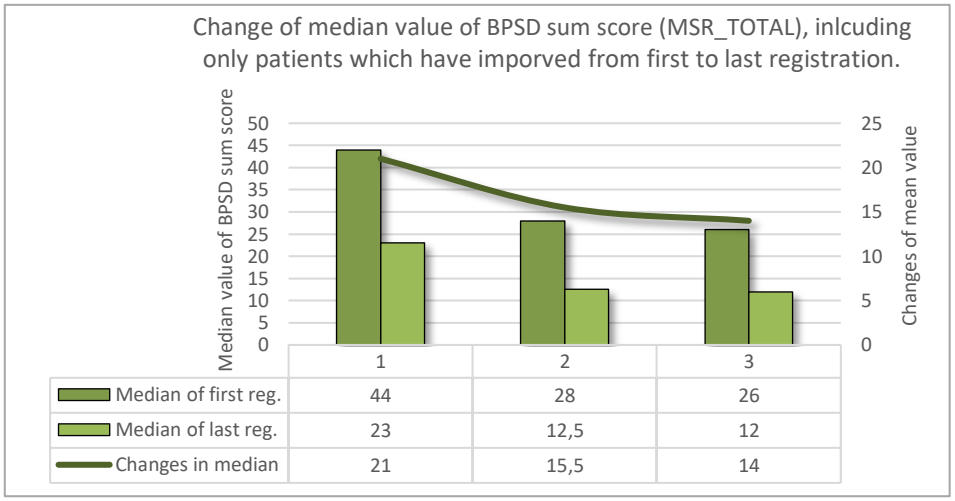


Figure 14. Change in median value in sum score of BPSD (MSR_TOTAL), including first and last improving registrations (minimum two reg.). Including 3 groups; (1) no *outdoor stay*, (2) all patients and (3) incl. *outdoor stay*

3.1.3.4. Interquartile mean (IQM) and median change of BPSD sum score (MSR_TOTAL)

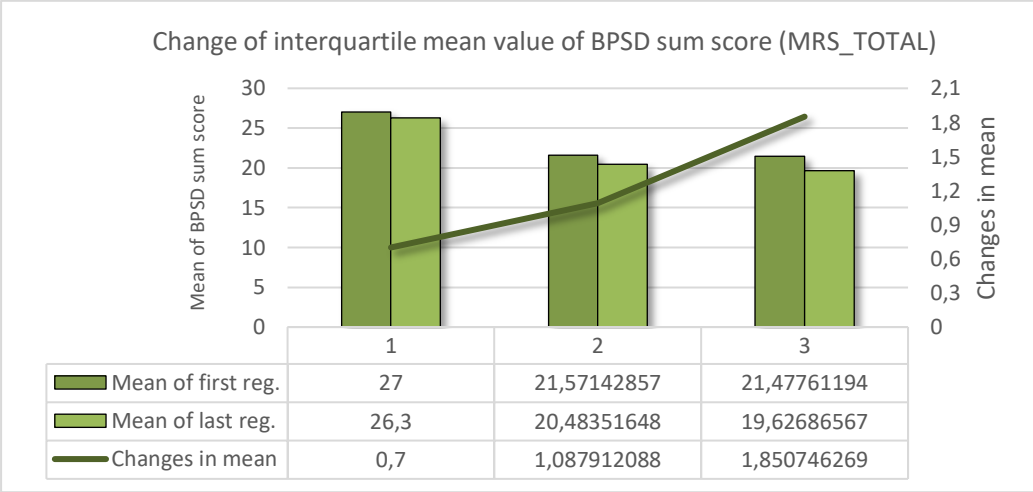


Figure 18. Change of mean value in sum score of BPSD (MSR_TOTAL), including first and last interquartile registrations (minimum two reg.). Including 3 groups; (1) no *outdoor stay*, (2) all registration and (3) incl. *outdoor stay*.

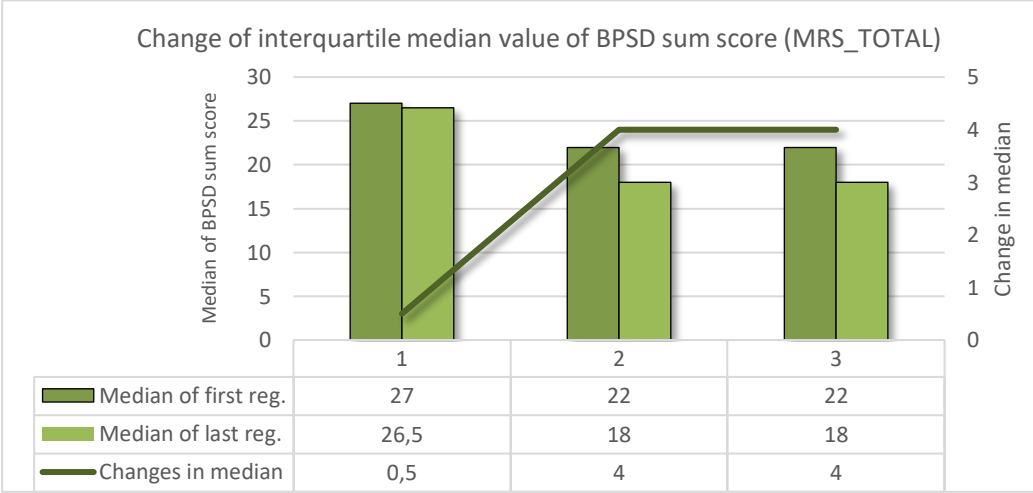


Figure 19. Change of median value in sum score of BPSD (MSR_TOTAL), including first and last interquartile registrations (minimum two reg.). Including 3 groups; (1) no *outdoor stay*, (2) all registration and (3) incl. *outdoor stay*.

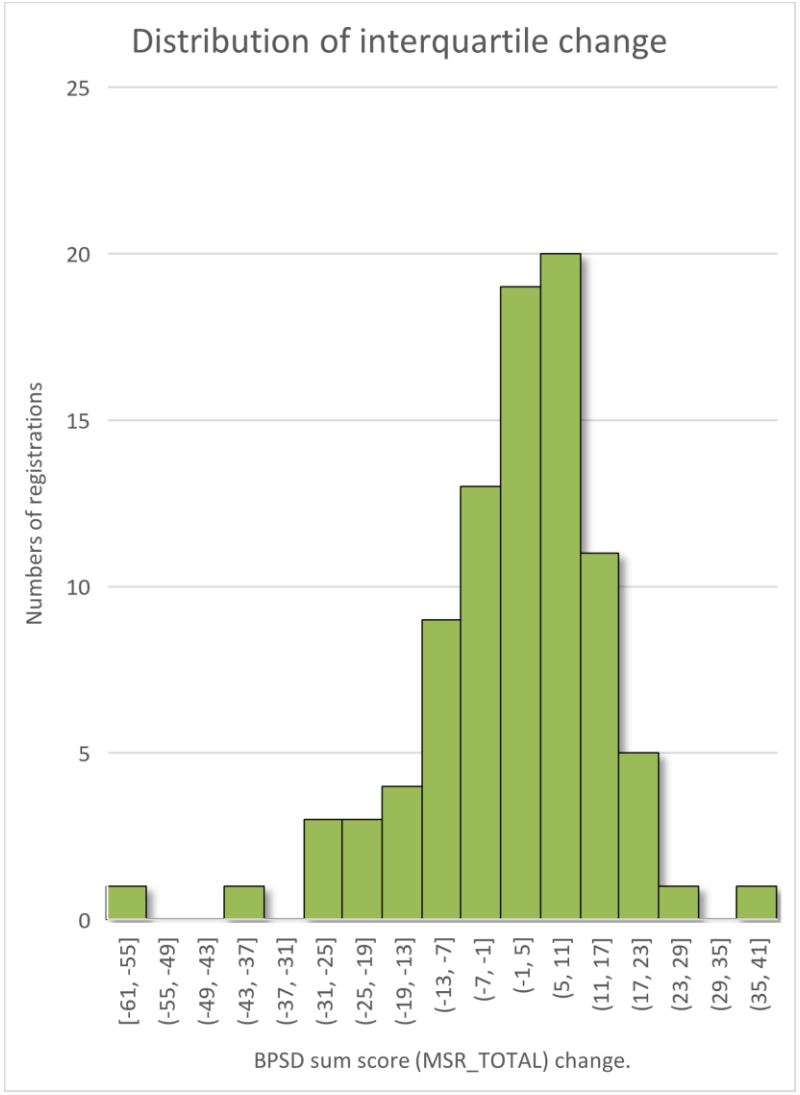


Figure 20. Distribution of change in BPSD sum score (MSR_TOTAL), first and last interquartile registration (minimum two reg.).

3.1.3.5. Falkenberg´s care homes in the BPSD registry

Table 7. Statistical features of Falkenberg´s dementia care homes

CARE HOME 1.		
Female:	N (%)	24 (69)
Male:	N (%)	12 (31)
Patients, total:	N	36
Registrations, total:	N	112
First registration, MSR_TOTAL:	Mean (SD) Median (IQR)	25,4 (19,3) 24,5 (39,5)
Last registration, MSR_TOTAL:	Mean (SD) Median (IQR)	22,8 (15,5) 24 (27)
MSR_OUTDOORS present in more than 50% of patients' registration series:	N (%)	13 (37)
MSR_OUTDOORS present in- or less than 50% of patients' registration series:	N (%)	21 (57)
Patients without MSR_OUTDOORS:	N (%)	2 (6)
CARE HOME 2.		
Female:	N (%)	8 (73)
Male:	N (%)	4 (27)
Patients, total:	N	11
Registrations, total:	N	32
First registration, MSR_TOTAL:	Mean (SD) Median (IQR)	25,9 (19,3) 28 (35)
Last registration, MSR_TOTAL:	Mean (SD) Median (IQR)	21,7 (14,8) 20 (25)
MSR_OUTDOORS present in more than 50% of patients' registration series:	N (%)	1 (9)
MSR_OUTDOORS present in- or less than 50% of patients' registration series:	N (%)	4 (36)
Patients without MSR_OUTDOORS:	N (%)	6 (55)
CARE HOME 3.		
Female:	N (%)	21 (75)
Male:	N (%)	7 (25)
Patients, total:	N	28
Registrations, total:	N	72
First registration, MSR_TOTAL:	Mean (SD) Median (IQR)	27,9 (21) 23 (27,5)
Last registration, MSR_TOTAL:	Mean (SD) Median (IQR)	17 (15,7) 13,5 (17,25)
MSR_OUTDOORS present in more than 50% of patients' registration series:	N (%)	10 (36)
MSR_OUTDOORS present in- or less than 50% of patients' registration series:	N (%)	10 (36)
Patients without MSR_OUTDOORS:	N (%)	8 (28)

The following section consists of data from the Swedish BPSD registry, divided in dementia care homes, which are presented in table 7 and further in figure 21 and 22. The included data are considered of certain interest according the project´s aim. That imply, inter alia, that patient with less than two registrations are excluded, i.e. the presentation includes patients with two or more registrations. By this measure, it's possible to quantity the BPSD progression.

Referring to table 7, females are overrepresented and about 6/10 patient are women. The number of registered patients differ between the different care homes, ranging from 36 patients in *care home 1* to 9 patients *care home 9.* Additionally, the first and last registrations of BPSD indicate a great variation of BPSD distribution and progression between the care homes. Furthermore, the data material contains a various number of extreme values (figure 21).

The percentage of patients which are included in the care measure *outdoor stay* also differ a lot between the care homes. For example, in *care home 6* all patients have been included in *outdoor stay* to some extent, whereas only 36% of the patients in *care home 4* have been included in the care measure (figure 22). Additionally, in *care home 9* almost every patient has been registered for *outdoor stay* in more than 50% of registrations, that is, for example, out of three registrations two would include *outdoor stay.*

Table7. Statistical features of Falkenberg´s dementia care homes

CARE HOME 4.		
Female:	N (%)	6 (55)
Male:	N (%)	5 (45)
Patients, total:	N	11
Registrations, total:	N	39
First registration, MSR_TOTAL:	Mean (SD) Median (IQR)	22,5 (19,1) 11 (30)
Last registration, MSR_TOTAL:	Mean (SD) Median (IQR)	19,3 (22,1) 5 (32)
MSR_OUTDOORS present in more than 50% of patients' registration series:	N (%)	3 (27)
MSR_OUTDOORS present in- or less than 50% of patients' registration series:	N (%)	1 (9)
Patients without MSR_OUTDOORS:	N (%)	7 (64)
CARE HOME 5.		
Female:	N (%)	17 (68)
Male:	N (%)	8 (32)
Patients, total:	N	25
Registrations, total:	N	92
First registration, MSR_TOTAL:	Mean (SD) Median (IQR)	21,4 (19,4) 18 (26)
Last registration, MSR_TOTAL:	Mean (SD) Median (IQR)	13,6 (13,3) 10 (15,5)
MSR_OUTDOORS present in more than 50% of patients' registration series:	N (%)	7 (28)
MSR_OUTDOORS present in- or less than 50% of patients' registration series:	N (%)	14 (56)
Patients without MSR_OUTDOORS:	N (%)	4 (16)
CARE HOME 6.		
Female:	N (%)	8 (50)
Male:	N (%)	8 (50)
Patients, total:	N	16
Registrations, total:	N	44
First registration, MSR_TOTAL:	Mean (SD) Median (IQR)	18,2 (15,5) 15 (19,75)
Last registration, MSR_TOTAL:	Mean (SD) Median (IQR)	19,7 (19,5) 12,5 (27)
MSR_OUTDOORS present in more than 50% of patients' registration series:	N (%)	8 (44)
MSR_OUTDOORS present in- or less than 50% of patients' registration series:	N (%)	10 (56)
Patients without MSR_OUTDOORS:	N (%)	0 (-)

Table7. Statistical features of Falkenberg´s dementia care homes

CARE HOME 7.		
Female:	N (%)	13 (57)
Male:	N (%)	10 (43)
Patients, total:	N	23
Registrations, total:	N	94
First registration, MSR_TOTAL:	Mean (SD)	38,9 (27)
	Median (IQR)	29 (44)
Last registration, MSR_TOTAL:	Mean (SD)	39,4 (24,5)
	Median (IQR)	37 (22)
MSR_OUTDOORS present in more than 50% of patients' registration series:	N (%)	11 (49)
MSR_OUTDOORS present in- or less than 50% of patients' registration series:	N (%)	4 (17)
Patients without MSR_OUTDOORS:	N (%)	8 (34)
CARE HOME 8.		
Female:	N (%)	9 (47)
Male:	N (%)	10 (53)
Patients, total:	N	19
Registrations, total:	N	44
First registration, MSR_TOTAL:	Mean (SD)	17,7 (14,9)
	Median (IQR)	16 (30)
Last registration, MSR_TOTAL:	Mean (SD)	13,3 (14)
	Median (IQR)	11 (24)
MSR_OUTDOORS present in more than 50% of patients' registration series:	N (%)	10 (53)
MSR_OUTDOORS present in- or less than 50% of patients' registration series:	N (%)	8 (42)
Patients without MSR_OUTDOORS:	N (%)	1 (5)
CARE HOME 9.		
Female:	N (%)	7 (78)
Male:	N (%)	2 (22)
Patients, total:	N	9
Registrations, total:	N	39
First registration, MSR_TOTAL:	Mean (SD)	25,3 (25)
	Median (IQR)	10 (46)
Last registration, MSR_TOTAL:	Mean (SD)	10,1 (7)
	Median (IQR)	8 (13,5)
MSR_OUTDOORS present in more than 50% of patients' registration series:	N (%)	8 (89)
MSR_OUTDOORS present in- or less than 50% of patients' registration series:	N (%)	0 (-)
Patients without MSR_OUTDOORS:	N (%)	1 (11)

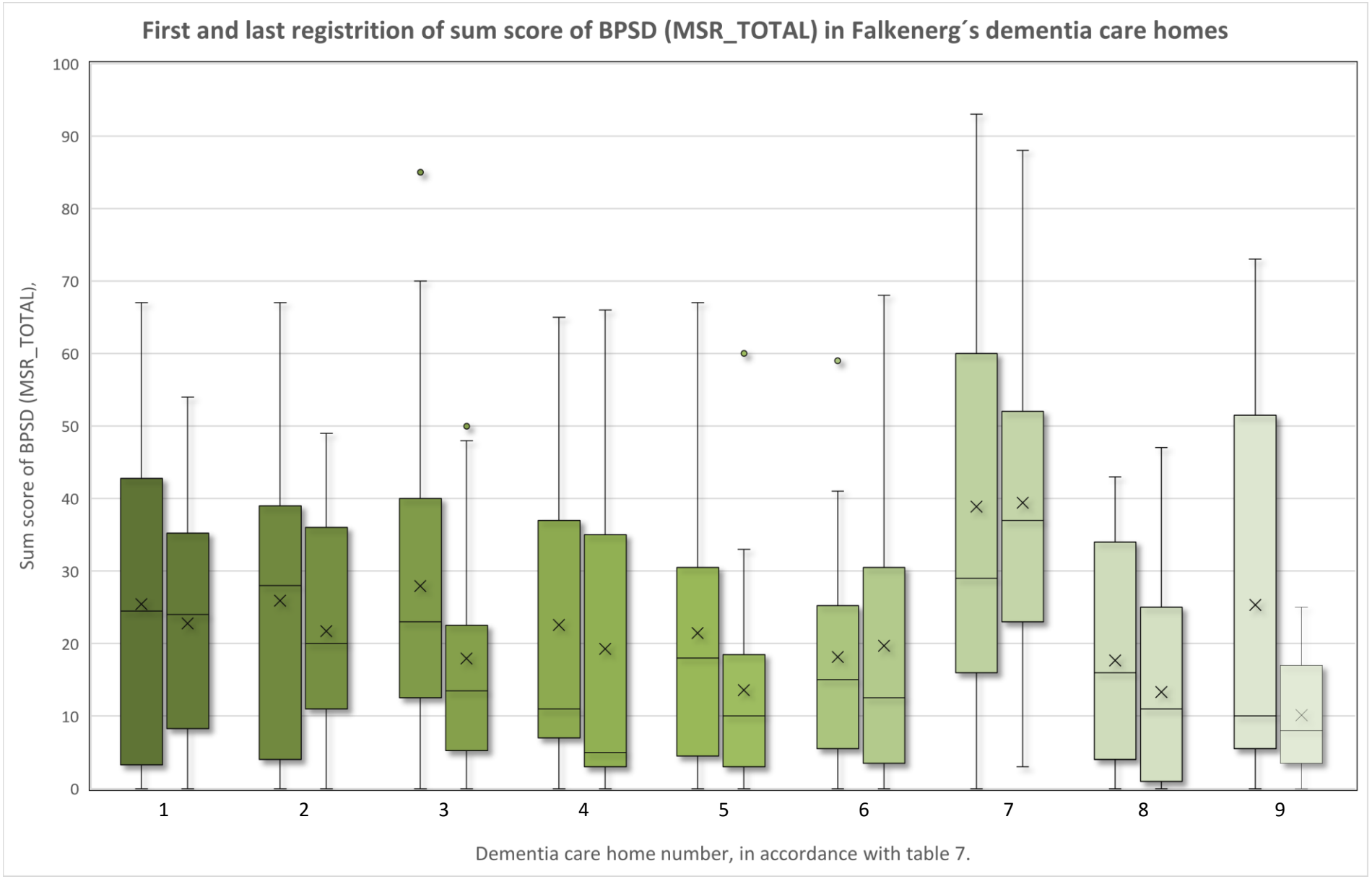


Figure 21. Box plot displaying each patient´s first and last registration of sum score of BPSD (MSR_TOTAL) divided in Falkenberg´s care homes, including patients with at least two registrations in the BPSD registry

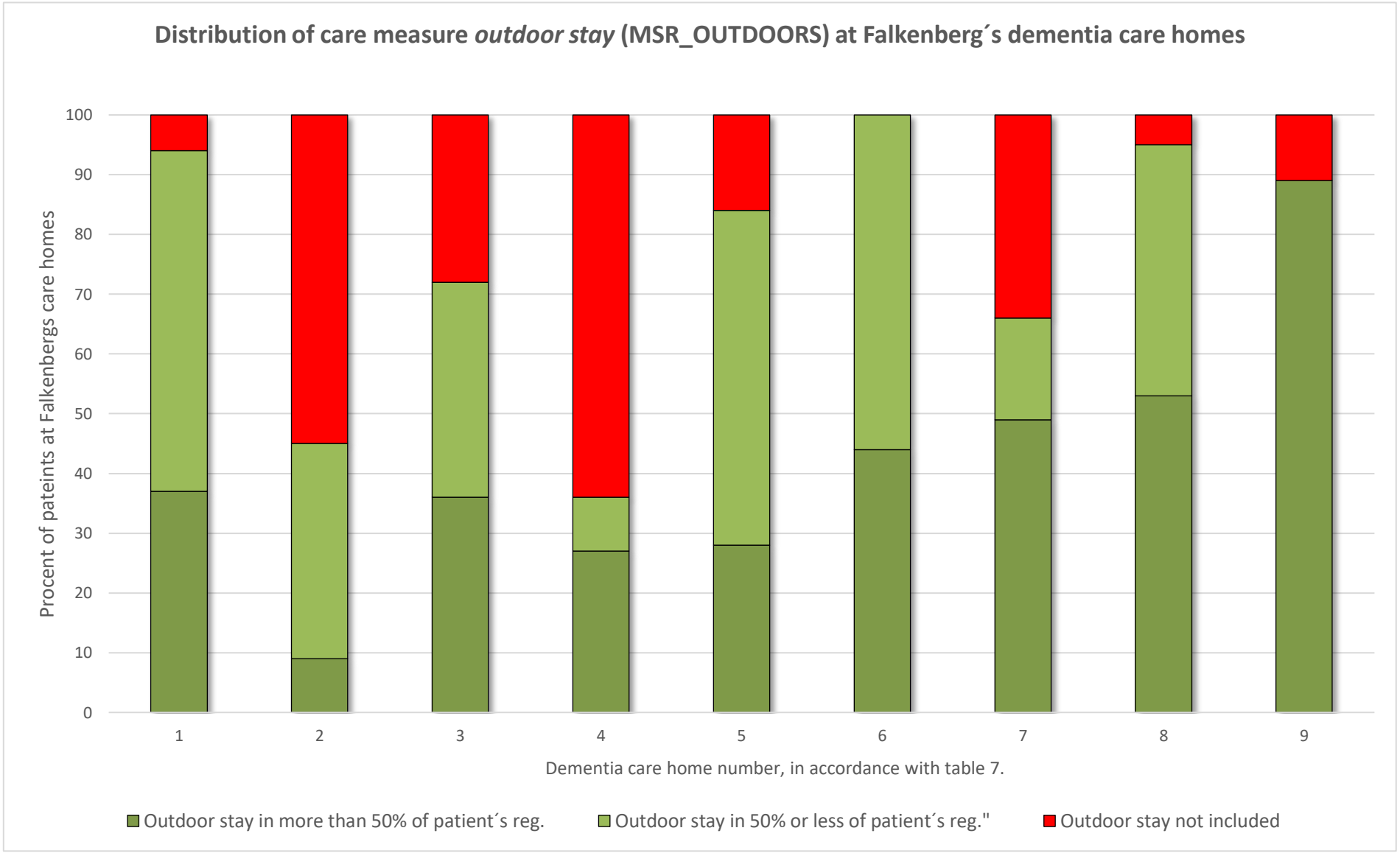


Figure 22. Distribution of care measure outdoor stay (MSR_OUTDOORS) at Falkenberg´s dementia care homes.

3.2. Outdoor environment assessment - Falkenberg´s dementia care homes

In the upcoming section the outdoor environmental assessments of the nine different dementia care homes are presented. The assessments were concluded by using the *Outdoor evaluation chart – dementia care*, further described in chapter 2. The assessments were performed in wintertime and the weather conditions differed between the assessment´s occasion. Moreover, the assessment for zone 1 and 2 came to include only common areas, i.e. private rooms aren't included, focusing on living areas such as dining rooms. This action was made due to the great variation between private rooms within each care home, e.g. points of the compass and outside configuration, and the assessment was estimated to become too extensive if those were included. Overall, the care homes are somewhat geographically separated (figure 23) and the perceived area configuration varied between urban and rural.

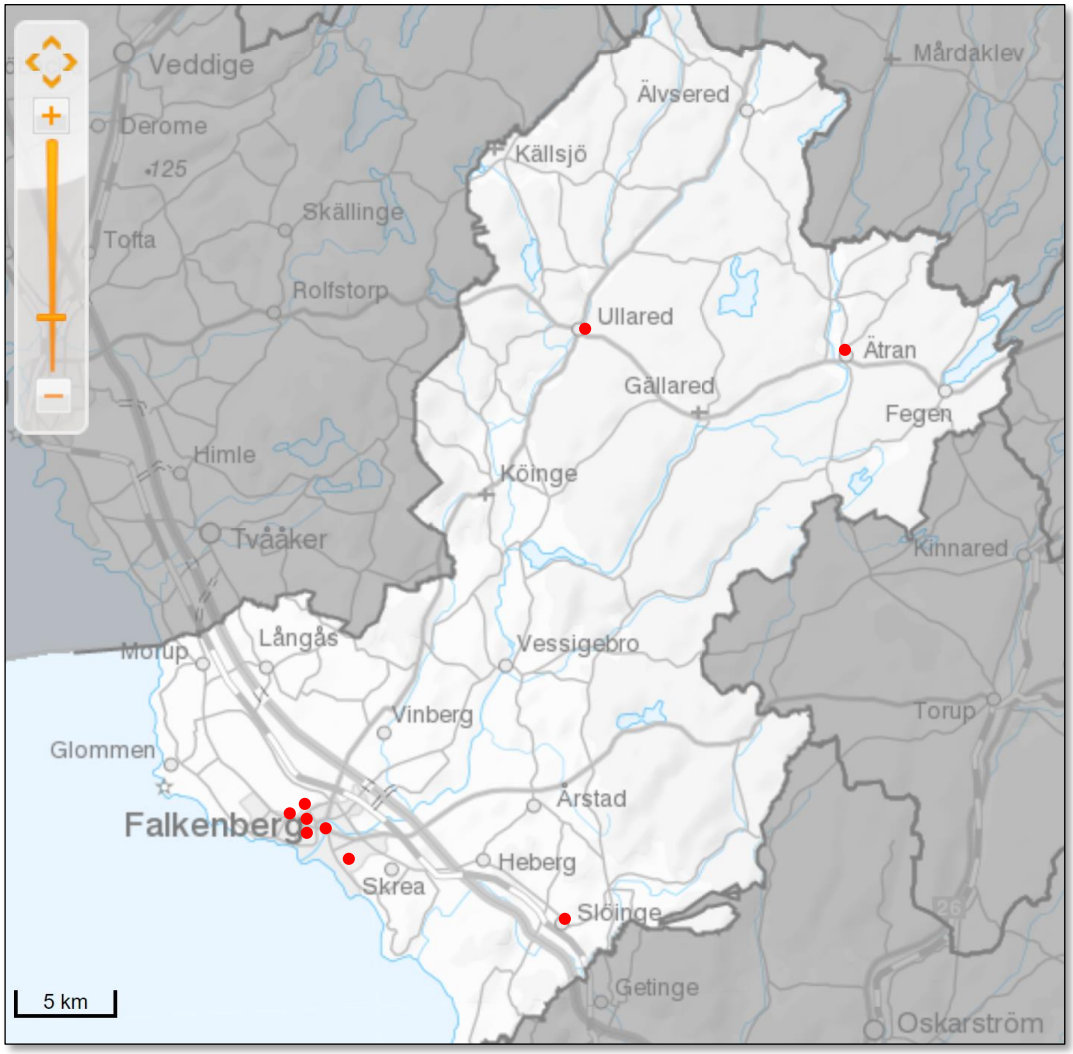


Figure 23. Location of dementia care homes in Falkenberg (Falkenberg kommunkarta. http://falkenberg.csm01.cartesia.se/cbkort?)

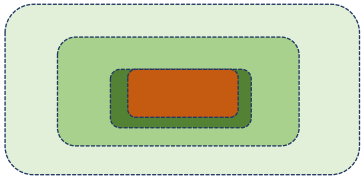


Fig 1. Model of the four zones of contact in subject x.

Care home 1.

- *Table based on the "Quality Evaluation Tool" – QET (Bengtsson, 2015)*[1]

	Zone 1	Zone 2	Zone 3	Zone 4
Overall description of zone	Zone 1 consists of 6 common living/dining rooms situated in three floors, from bottom till the top of the building. The design offers a limited view of zone 3+4 and glassed door, leading to larger patio/balcony, creates opportunity for inflow fresh air and fragrances. In common areas the corridors are lacking window, but other spaces are designed with windows with equal view as in common/dining rooms	Zone 2 exists as paved patios or balcony of approximately 20 square meters, including ceiling – one in each unit (total 6). Subjects for zone 2 are facing the courtyard in southwest, zone 3, but it´s only possible to entre zone 3 from the bottom floor. Zone 4 is also visible from the current zone.	Zone 3 is in south-facing position and exists as a courtyard in the "V" created by the care home building. The area is approximately 1400 square meters and consists of lawns, trees and hedges, paved walking tracks with benches and a patio (including a pergola) for social activity as well as cultivation boxes for planting. The area is enclosed either by buildings or wooden fences. Buildings are protecting the zone from transparency from ground level, but not high apartment buildings in zone 4.	Zone 4 consists of a grove in the north, villas in the east and northwest, and apartment area in southwest to southeast. From zone 3, the visual scale I relatively low, but it´s possible to observe people passing by in the apartment area and cars in the nearby parking lot.

Environmental qualities

Distinctly perceived or present
Vaguely perceived or present
Neither perceived or present

"Comfortable design"

1. Closeness and easy access
a) visibility (zone 1 & 2)
b) accessibility (zone 1 & 2)
2. Enclosure
3. Safety and security
a) physical
b) phycological
4. Familiarity
5. Orientation and wayfinding
6. Different options in different kind of weather

Position:	**Common living/dining area**	**Common area**	**Common outdoor area**	**Public outdoor area**
	(From the zone, perceived qualities for zone 3)	(From the zone, perceived qualities for zone 3)	(Present qualities in the current zone)	(Present qualities in the current zone)
	1a 1b 2 3a 3b 4 5 6	1a 1b 2 3a 3b 4 5 6	1 2 3a 3b 4 5 6	1 2 3a 3b 4 5 6
	1a 1b 2 3a 3b 4 5 6	1a 1b 2 3a 3b 4 5 6	1 2 3a 3b 4 5 6	1 2 3a 3b 4 5 6
	~~1a 1b 2 3a 3b 4 5 6~~	~~1a 1b 2 3a 3b 4 5 6~~	~~1 2 3a 3b 4 5 6~~	~~1 2 3a 3b 4 5 6~~
	(!) beds are not used outside private rooms	(!) beds are not used outside private rooms	(!) beds are not used outside private rooms	(!) beds are not used outside private rooms

The outdoor environment can be experienced comfortably and safely from zones 1 & 2, with low or neglectable risk of negative impressions?			
	Zone 1	YES	NO
	Zone 2	YES	NO*

* Balcony not glassed.

"Stimulating design"

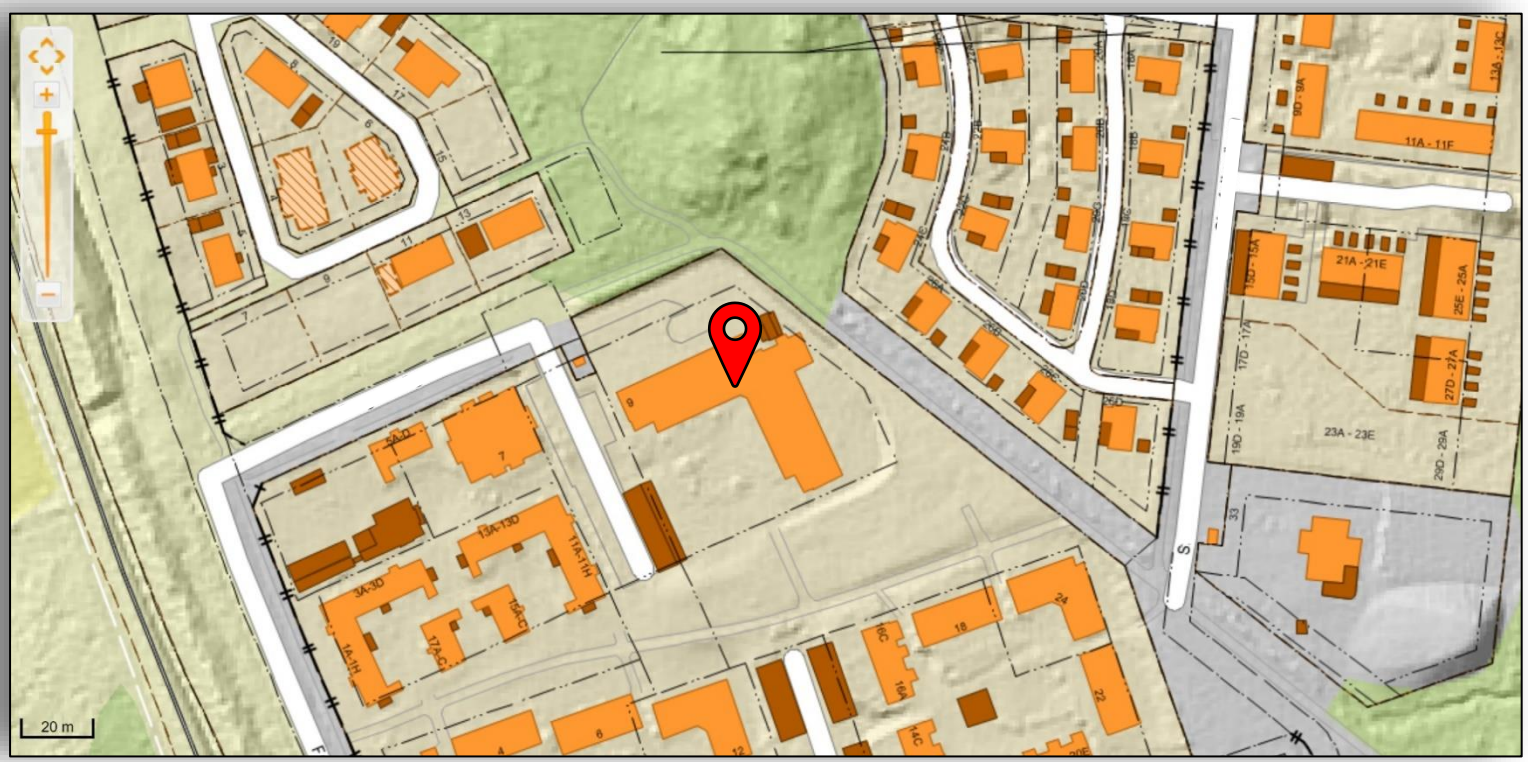
1. Contact with surrounding life
2. Social opportunities
3. Joyful and meaningful act.
4. Culture and connection to past
5. Symbolism/reflection
6. Prospect
7. Space
8. Rich in species
9. Sensual pleasures from nature
10. Seasons changing in nature
11. Serene
12. Wild nature
13. Refuge

	(From the zone, perceived qualities in zone 3&4)	(From the zone, perceived qualities in zone 3&4)	(Perceived or present qualities from the zone)	(Perceived or present qualities from the zone)
	1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13
	1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13
	~~1 2 3 4 5 6 7~~ ~~8 9 10 11 12 13~~	~~1 2 3 4 5 6 7~~ ~~8 9 10 11 12 13~~	~~1 2 3 4 5 6 7~~ ~~8 9 10 11 12 13~~	~~1 2 3 4 5 6 7~~ ~~8 9 10 11 12 13~~
	(!) beds are not used outside private rooms	(!) beds are not used outside private rooms	(!) beds are not used outside private rooms	(!) beds are not used outside private rooms

The furniture layout, e.g. dining table and chairs, in zones 1 & 2 is well customized to support contact with the outdoor environment?	YES	NO*

* In zone 1, furniture standing in front of (partly blocking) or facing away from windows.

[1] Bengtsson, A. (2015) ***From experiences of the outdoors to the design of healthcare environments***. Doctoral Thesis, Swedish University of Agricultural Sciences, Alnarp.



Falkenberg kommunkarta. http://falkenberg.csm01.cartesia.se/cbkort?

Care home 1.

Number of floors	**3**
Total number of accommodations	**48**
Number of accommodations in dementia units	**48**
Driving distance to Falkenberg city centre (km)	**1,7**
Perceived area configuration (urban, rural)	**Urban**

Zone 1

Zone 2

Zone 3

Zone 4

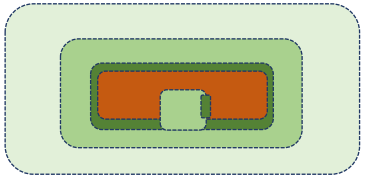


Fig 1. Model of the four zones of contact in subject x.

Care home 2.

- *Table based on the "Quality Evaluation Tool" – QET (Bengtsson, 2015)*[2]

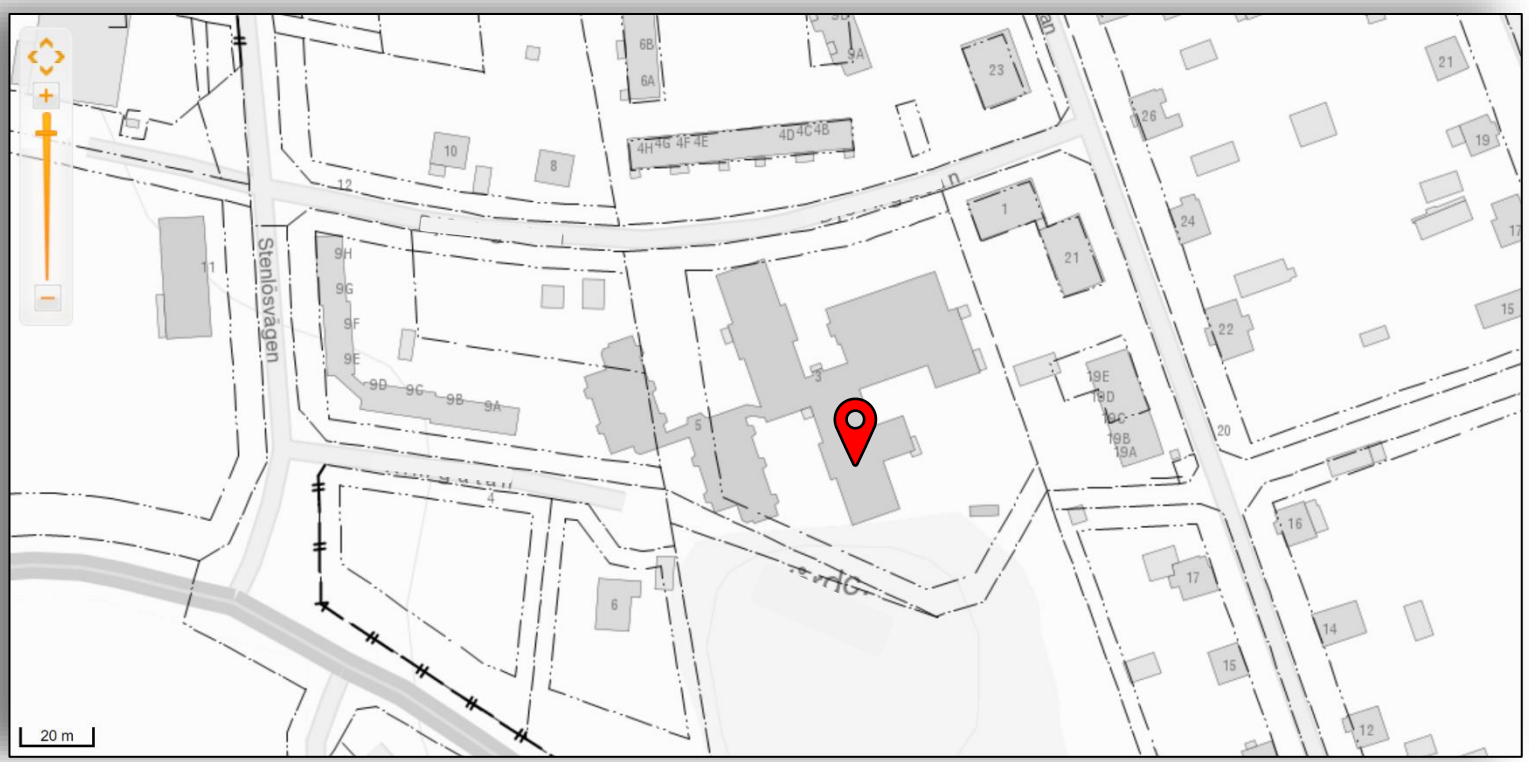
	Zone 1	Zone 2	Zone 3	Zone 4
Overall description of zone	Zone 1 is situated at ground floor and consists of a living/dining room with large window facing a courtyard garden (zone 3) and a glassed balcony (zone 2), which is connected to the zone via a glassed door. Zone 4 is hard to spot from the current zone. The windows don't open, but their size allows a high amount of daylight to reach the indoor and make it possible to observe the outdoor when sitting. The furniture doesn't block the view of the outdoor but could be better organized to support contact.	Zone 2 is a small glassed balcony, approximately 10 square meters. The zone is easily accessed from zone 1 but doesn't allow transfer to neither zone 3 or 4, if going out you´ll have to go via the inside of the building. From zone 2, the courtyard garden (zone 3) and a nearby grove (zone 4) is visible. The glass section is possible to open, which allow ventilation and improved contact with the outdoor environment.	Zone 3 is distributed around the whole care home building, but its most interesting part consists of a 500 square meters courtyard garden placed right outside the dementia unit. It is well enclosed, which the remaining zone isn't, by the building at three sides and a green netting fence on the fourth, which means it´s south positioned. Overall, zone 3 consists of lawns and smaller bushes and trees, as well as paved pathways which unfortunately doesn´t goes all the way around the building. There are benches, but these are rather sparsely deployed.	Zone 4 consists of villas area from west to southeast and lawns and a grow in south-southwest. From zone 1 and 2 its possible to observe the trees in the grove, which also is the case for the courtyard garden. When moving outside the fenced courtyard, its possible to see the remaining part of zone 4.

Environmental qualities

Distinctly perceived or present
Vaguely perceived or present
Neither perceived or present

	Common living/dining area	Common area	Common outdoor area	Public outdoor area
"Comfortable design" *1. Closeness and easy access* *a) visibility (zone 1 & 2)* *b) accessibility (zone 1 & 2)* *2. Enclosure* *3. Safety and security* *a) physical* *b) phycological* *4. Familiarity* *5. Orientation and wayfinding* *6. Different options in different kind of weather*	Position: (From the zone, perceived qualities for zone 3)	(From the zone, perceived qualities for zone 3)	(Present qualities in the current zone)	(Present qualities in the current zone)
	1a 1b 2 3a 3b 4 5 6 3.a) pathways hard to spot from inside	1a 1b 2 3a 3b 4 5 6 1.b) must go via zone 1 to reach outdoor. 3.a) pathways hard to spot from the zone.	1 2 3a 3b 4 5 6	1 2 3a 3b 4 5 6
	1a 1b 2 3a 3b 4 5 6 3.a) pathways hard to spot from inside	1a 1b 2 3a 3b 4 5 6 1.b) must go via zone 1 to reach outdoor. 3.a) pathways hard to spot from the zone.	1 2 3a 3b 4 5 6	1 2 3a 3b 4 5 6
	~~1a 1b 2 3a 3b 4 5 6~~ (!) beds are not used outside private rooms	~~1a 1b 2 3a 3b 4 5 6~~ (!) beds are not used outside private rooms	~~1 2 3a 3b 4 5 6~~ (!) beds are not used outside private rooms	~~1 2 3a 3b 4 5 6~~ (!) beds are not used outside private rooms
The outdoor environment can be experienced comfortably and safely from zones 1 & 2, with low or neglectable risk of negative impressions?	Zone 1 YES NO Zone 2 YES NO			
"Stimulating design" *1. Contact with surrounding life* *2. Social opportunities* *3. Joyful and meaningful act.* *4. Culture and connection to past* *5. Symbolism/reflection* *6. Prospect* *7. Space* *8. Rich in species* *9. Sensual pleasures from nature* *10. Seasons changing in nature* *11. Serene* *12. Wild nature* *13. Refuge*	(From the zone, perceived qualities in zone 3&4)	(From the zone, perceived qualities in zone 3&4)	(Perceived or present qualities from the zone)	(Perceived or present qualities from the zone)
	1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13 (!) based on ability to enter grove.
	1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13 (!) based on disability to entre grove.
	~~1 2 3 4 5 6 7~~ ~~8 9 10 11 12 13~~ (!) beds are not used outside private rooms	~~1 2 3 4 5 6 7~~ ~~8 9 10 11 12 13~~ (!) beds are not used outside private rooms	~~1 2 3 4 5 6 7~~ ~~8 9 10 11 12 13~~ (!) beds are not used outside private rooms	~~1 2 3 4 5 6 7~~ ~~8 9 10 11 12 13~~ (!) beds are not used outside private rooms
The furniture layout, e.g. dining table and chairs, in zones 1 & 2 is well customized to support contact with the outdoor environment?	YES NO			

[2] Bengtsson, A. (2015) ***From experiences of the outdoors to the design of healthcare environments***. Doctoral Thesis, Swedish University of Agricultural Sciences, Alnarp.



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Care home 2.

Number of floors	**2**
Total number of accommodations	**42**
Number of accommodations in dementia units	**10**
Driving distance to Falkenberg city centre (km)	**15,4**
Perceived area configuration (urban, rural)	**Rural/ Urban**

Zone 1

Zone 2

Zone 3

Zone 4

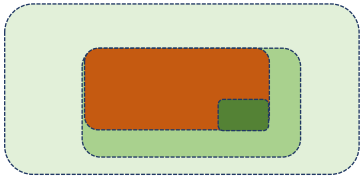


Fig 1. Model of the four zones of contact in subject x.

Care home 3.

- *Table based on the "Quality Evaluation Tool" – QET (Bengtsson, 2015)*[3]

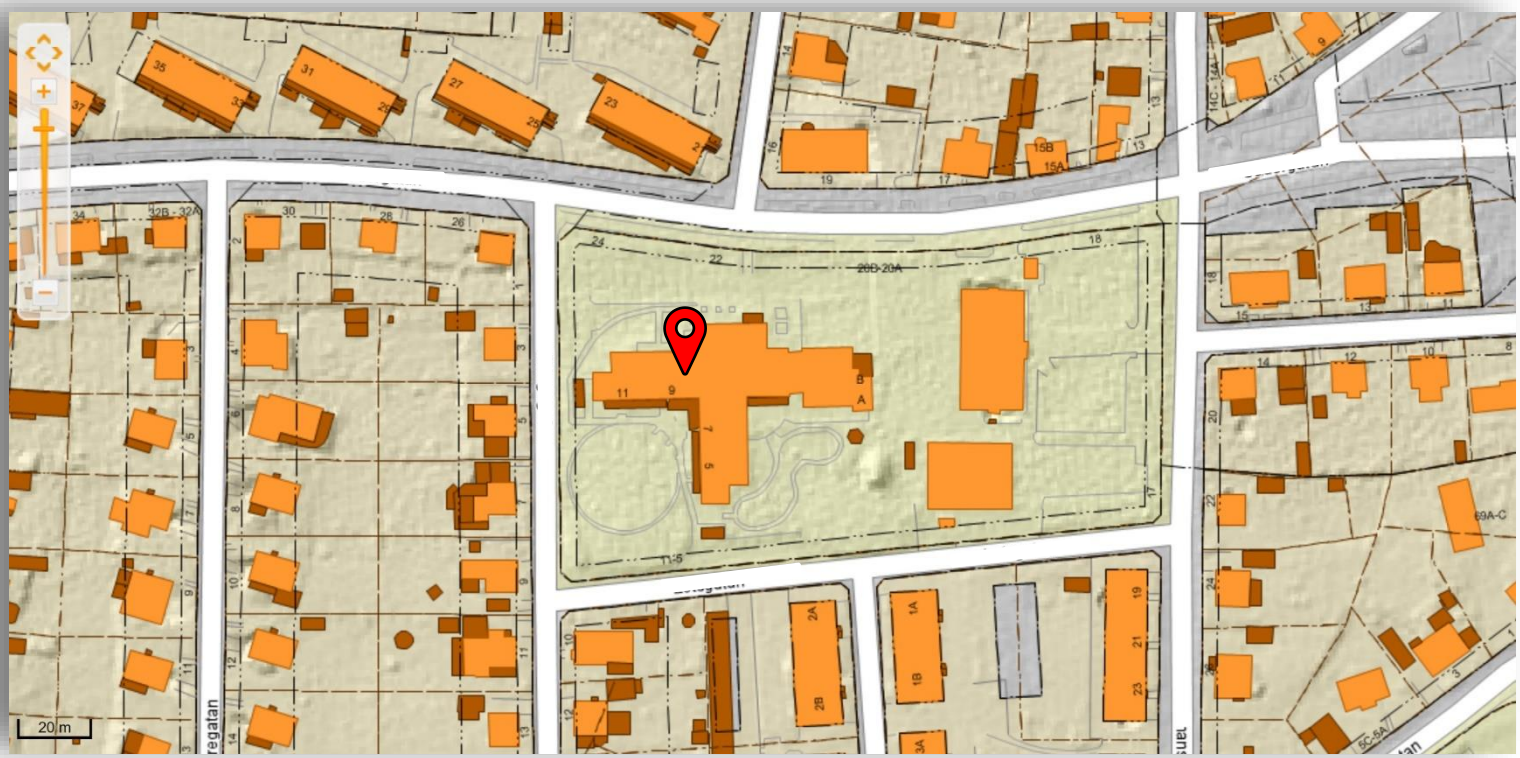
	Zone 1	Zone 2	Zone 3	Zone 4
Overall description of zone	Zone 1 is distributed in two dining/living room, connected via an indoor corridor and a common zone 2, all at 3rd floor. Window and glassed doors are facing southwest, but the view is limited due to glassed balcony (zone2) outside, and only parts of the zone 4 can be spotted from the current zone. Though, the room is perceived light and windows are possible to open. The furnishing makes no obstacle for the view of the outdoor, but it could have been better distributed to better increase outdoor contact.	Zone 2 is a large glassed balcony, approximately 45 square meters, at 3rd floor. Facing southwest, the balcony offers a view over the nearby residential district and in the horizon it's possible to observe the ocean. Further, a kindergarten (zone 3) is visible down below. The furnishing makes social activity possible, but it could have been better planned to increase outdoor contact. The glassed section is possible to open, which good for ventilation and contact with the outdoor.	Zone 3 exist south of the building, partly as a kindergarten and partly as a garden designed for the care home. The first mentioned is full of life and noise from children's play, further it includes green lawns and dense bushes. The other part of zone 3, the custom garden, is an area of approximately 1000 square meters and is designed with paved walking tacks with benches, pergolas, a small pond and various vegetation. The area contains possibilities for social activity, including cultivation in associated boxes.	Zone 4 consist of a built/urban environment all around, both villas and apartment complex, and roads with low to moderate traffic can be observed. East of the care building lies a school, which contribute to even more life and movement in the zone.

Environmental qualities

Distinctly perceived or present
Vaguely perceived or present
Neither perceived or present

	Common living/dining area	**Common area**	**Common outdoor area**	**Public outdoor area**
"Comfortable design" *1. Closeness and easy access* *a) visibility (zone 1 & 2)* *b) accessibility (zone 1 & 2)* *2. Enclosure* *3. Safety and security* *a) physical* *b) phycological* *4. Familiarity* *5. Orientation and wayfinding* *6. Different options in different kind of weather*	Position: (From the zone, perceived qualities for zone 3)	(From the zone, perceived qualities for zone 3)	(Present qualities in the current zone)	(Present qualities in the current zone)
	1a 1b 2 3a 3b 4 5 6 (!) not possible spot zone 3 from zone 1. 1.b), vague due to unit placement on 3rd floor	1a 1b 2 3a 3b 4 5 6 (!) not possible to spot custom garden (part of zone 3) from zone 2. 1.b) bad due to unit placement on 3rd floor	1 2 3a 3b 4 5 6 (!) analysis only for custom garden, not kindergarten. 1. Vague do to dementia unit on 3rd floor.	1 2 3a 3b 4 5 6
	1a 1b 2 3a 3b 4 5 6 (!) not possible spot zone 3 from zone 1 1.b), vague du to unit placement on 3rd floor	1a 1b 2 3a 3b 4 5 6 (!) not possible to spot custom garden (part of zone 3) from zone 2. 1.b) bad due to unit placement on 3rd floor	1 2 3a 3b 4 5 6 (!) analysis only for custom garden, not kindergarten. 1. Vague do to dementia unit on 3rd floor.	1 2 3a 3b 4 5 6
	~~1a 1b 2 3a 3b 4 5 6~~ (!) beds are not used outside private rooms	~~1a 1b 2 3a 3b 4 5 6~~ (!) beds are not used outside private rooms	~~1 2 3a 3b 4 5 6~~ (!) beds are not used outside private rooms	~~1 2 3a 3b 4 5 6~~ (!) beds are not used outside private rooms
	The outdoor environment can be experienced comfortably and safely from zones 1 & 2, with low or neglectable risk of negative impressions?	Zone 1 YES NO Zone 2 YES NO		
"Stimulating design" *1. Contact with surrounding life* *2. Social opportunities* *3. Joyful and meaningful act.* *4. Culture and connection to past* *5. Symbolism/reflection* *6. Prospect* *7. Space* *8. Rich in species* *9. Sensual pleasures from nature* *10. Seasons changing in nature* *11. Serene* *12. Wild nature* *13. Refuge*	(From the zone, perceived qualities in zone 3&4)	(From the zone, perceived qualities in zone 3&4)	(Perceived or present qualities from the zone)	(Perceived or present qualities from the zone)
	1 2 3 4 5 6 7 8 9 10 11 12 13 (!) hard to spot qualities in zone 3 and 4 from the current zone due to balcony figuration.	1 2 3 4 5 6 7 8 9 10 11 12 13 (!) can´t spot custom garden from zone 2.	1 2 3 4 5 6 7 8 9 10 11 12 13 (!) analysis from custom garden perspective	1 2 3 4 5 6 7 8 9 10 11 12 13
	1 2 3 4 5 6 7 8 9 10 11 12 13 (!) ard to spot qualities in zone 3 and 4 from the current zone due to balcony figuration.	1 2 3 4 5 6 7 8 9 10 11 12 13 (!) can´t spot custom garden from zone 2.	1 2 3 4 5 6 7 8 9 10 11 12 13 (!) analysis from custom garden perspective	1 2 3 4 5 6 7 8 9 10 11 12 13
	~~1 2 3 4 5 6 7~~ ~~8 9 10 11 12 13~~ (!) beds are not used outside private rooms	~~1 2 3 4 5 6 7~~ ~~8 9 10 11 12 13~~ (!) beds are not used outside private rooms	~~1 2 3 4 5 6 7~~ ~~8 9 10 11 12 13~~ (!) beds are not used outside private rooms	~~1 2 3 4 5 6 7~~ ~~8 9 10 11 12 13~~ (!) beds are not used outside private rooms
	The furniture layout, e.g. dining table and chairs, in zones 1 & 2 is well customized to support contact with the outdoor environment?	YES NO		

[3] Bengtsson, A. (2015) ***From experiences of the outdoors to the design of healthcare environments***. Doctoral Thesis, Swedish University of Agricultural Sciences, Alnarp.



Care home 3.

Number of floors	**3**
Total number of accommodations	**60**
Number of accommodations in dementia units	**20**
Driving distance to Falkenberg city centre (km)	**1**
Perceived area configuration (urban, rural)	**Urban**

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Zone 1

Zone 2

Zone 3

Zone 4

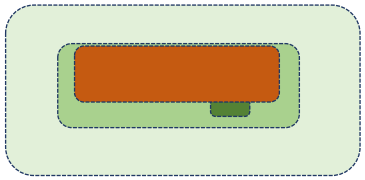


Fig 1. Model of the four zones of contact in subject x.

Care home 4.

- *Table based on the "Quality Evaluation Tool" – QET (Bengtsson, 2015)*[4]

	Zone 1	Zone 2	Zone 3	Zone 4
Overall description of zone	Zone 1 is situated at 2nd floor and exists as a dining room with a window facing north and a living room with a widow plus a glassed door, which leads out to a small balcony in south. Overall, the view of the outdoor is rather limited due to few windows and balcony placement, though the windows are possible to open. Only zone 4 is visible from the current zone.	Zone two exists as a small balcony, about 2 square meters, at 2nd floor. The balcony is without ceiling and any other weather protection. From the zone it´s possible to see parts of both zone 3 and 4.	Zone 3 is rather incoherent and is missing clear boundaries to zone 4. The current zone is mostly perceived south of the building, which is in constellation of smaller lawns, pathways with some benches, bushes and small trees. The zone includes a stone-paved area with possibilities for social and meaningful activity, such as cultivation in associated boxes. Overall, the zone is perceived as rather small and enclosed by the buildings in zone 4.	Zone 4 consists of an urban area of villas and apartment buildings, and the visual scale is very low. Not far from the care home there is a supermarket and a quite busy road.

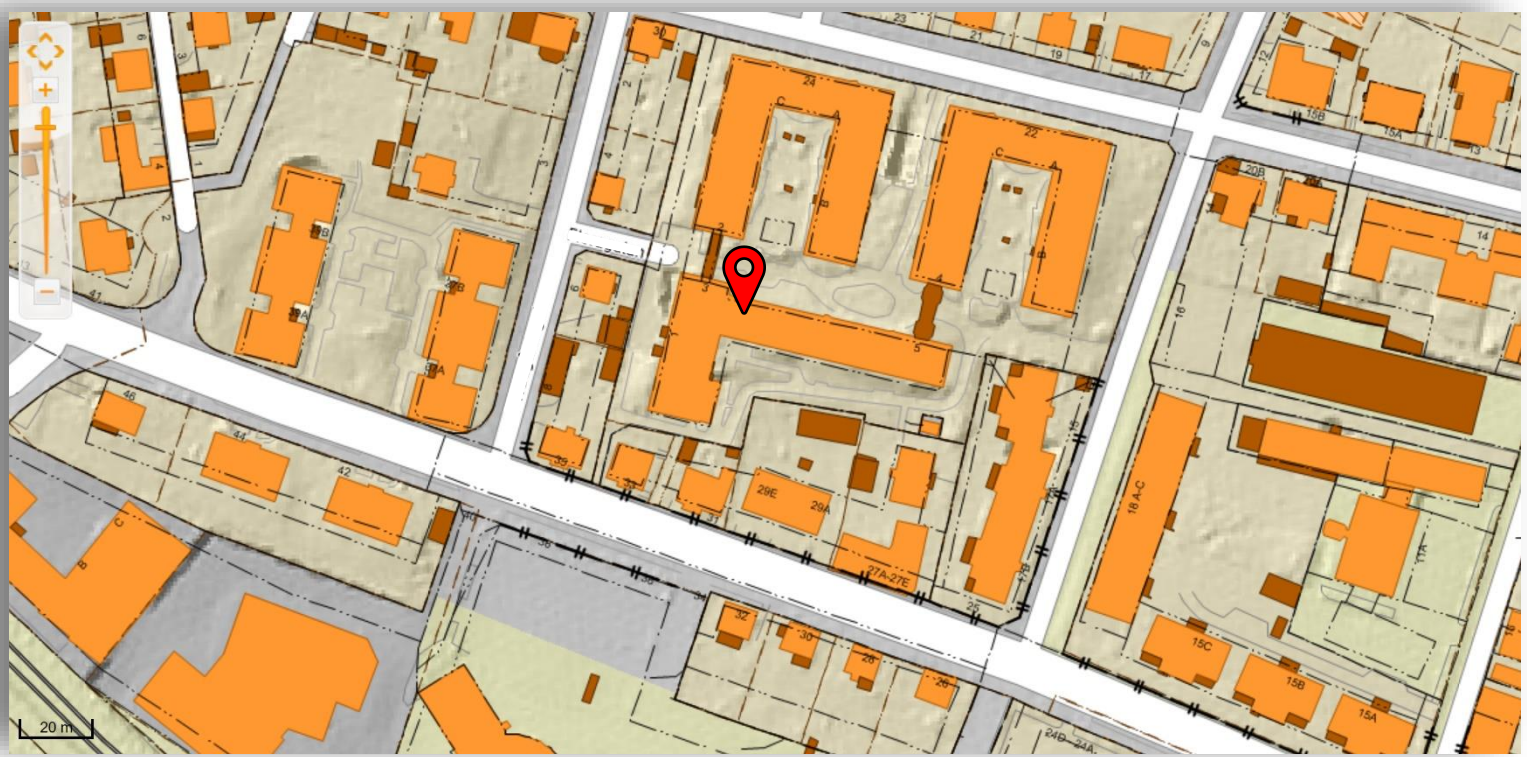
Environmental qualities

Distinctly perceived or present
Vaguely perceived or present
Neither perceived or present

	Common living/dining area	**Common area**	**Common/public outdoor area**	**Public outdoor area**
"Comfortable design" *1. Closeness and easy access* *a) visibility (zone 1 & 2)* *b) accessibility (zone 1 & 2)* *2. Enclosure* *3. Safety and security* *a) physical* *b) phycological* *4. Familiarity* *5. Orientation and wayfinding* *6. Different options in different kind of weather*	Position:	(From the zone, perceived qualities for zone 3)	(From the zone, perceived qualities for zone 3)	(Present qualities in the current zone)	(Present qualities in the current zone)
	1a 1b 2 3a 3b 4 5 6	1a 1b 2 3a 3b 4 5 6	1 2 3a 3b 4 5 6	1 2 3a 3b 4 5 6
	(!) zone 3 not possible to spot from current zone 1.b) Vague do to dementia unit placement on 3rd floor.		1. Vague do to dementia unit placement on 3rd floor	
	1a 1b 2 3a 3b 4 5 6	1a 1b 2 3a 3b 4 5 6	1 2 3a 3b 4 5 6	1 2 3a 3b 4 5 6
	(!) Zone 3 not possible to spot from current zone 1.b) Bad do to dementia unit placement on 3rd floor.		1. Bad do to dementia unit placement on 3rd floor	
	~~1a 1b 2 3a 3b 4 5 6~~	~~1a 1b 2 3a 3b 4 5 6~~	~~1 2 3a 3b 4 5 6~~	~~1 2 3a 3b 4 5 6~~
	(!) beds are not used outside private rooms	(!) beds are not used outside private rooms	(!) beds are not used outside private rooms	(!) beds are not used outside private rooms
	The outdoor environment can be experienced comfortably and safely from zones 1 & 2, with low or neglectable risk of negative impressions?	Zone 1 YES NO Zone 2 YES NO		

		(From the zone, perceived qualities in zone 3&4)	(From the zone, perceived qualities in zone 3&4)	(Perceived or present qualities from the zone)	(Perceived or present qualities from the zone)
"Stimulating design" *1. Contact with surrounding life* *2. Social opportunities* *3. Joyful and meaningful act.* *4. Culture and connection to past* *5. Symbolism/reflection* *6. Prospect* *7. Space* *8. Rich in species* *9. Sensual pleasures from nature* *10. Seasons changing in nature* *11. Serene* *12. Wild nature* *13. Refuge*		1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13
		(!) Small and few windows, urban characteristics in zone 4			
		1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13
		(!) Small and few windows, urban characteristics in zone 4			
		~~1 2 3 4 5 6 7~~ ~~8 9 10 11 12 13~~	~~1 2 3 4 5 6 7~~ ~~8 9 10 11 12 13~~	~~1 2 3 4 5 6 7~~ ~~8 9 10 11 12 13~~	~~1 2 3 4 5 6 7~~ ~~8 9 10 11 12 13~~
		(!) beds are not used outside private rooms	(!) beds are not used outside private rooms	(!) beds are not used outside private rooms	(!) beds are not used outside private rooms
		The furniture layout, e.g. dining table and chairs, in zones 1 & 2 is well customized to support contact with the outdoor environment?	YES NO		

[4] Bengtsson, A. (2015) ***From experiences of the outdoors to the design of healthcare environments***. Doctoral Thesis, Swedish University of Agricultural Sciences, Alnarp.



Care home 4.

Number of floors	**2**
Total number of accommodations	**?**
Number of accommodations in dementia units	**9**
Driving distance to Falkenberg city centre (km)	**0,5**
Perceived area configuration (urban, rural)	**Urban**

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Zone 1

Zone 2

Zone 3

Zone 4

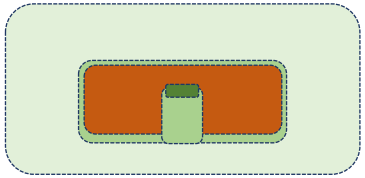


Fig 1. Model of the four zones of contact in subject x.

Care home 5.

- *Table based on the "Quality Evaluation Tool" – QET (Bengtsson, 2015)*[5]

	Zone 1	Zone 2	Zone 3	Zone 4
Overall description of zone	Zone 1 is divided in two dining/living rooms, one in each dementia unit (2). The rooms have large windows and a glassed door facing a small courtyard garden (zone 3). The furniture are rather well distributed to allow the residents to observe the outdoor environment.	Zone 2 is very limited and could be questioned if it exists at all. If it is there, it exists as a paved area right outside zone 1. It is directly linked to- and without any obvious distinctions from to the rest of the courtyard (zone 3). An awning is possible to use for e.g. rain or sun shelter. From the zone its possible to observe both zone 3 and 4.	Zone 3 is mostly present in form of courtyards gardens, protected by the walls of the building and paling or netting fence. The areas are rather small, 200 respectively 500 square meters. The zone consists of both stone-coated surfaces and lawn, further it includes both flower beds and cultivation boxes. From the zone parts of zone 4 I visible.	Zone 4 consists of a nearby inaccessible forest in west to north, and residential district in all other direction. Not far from the care home is a supermarket which in turn is situated nearby a road with heavy traffic.

Environmental qualities

Distinctly perceived or present
Vaguely perceived or present
Neither perceived or present

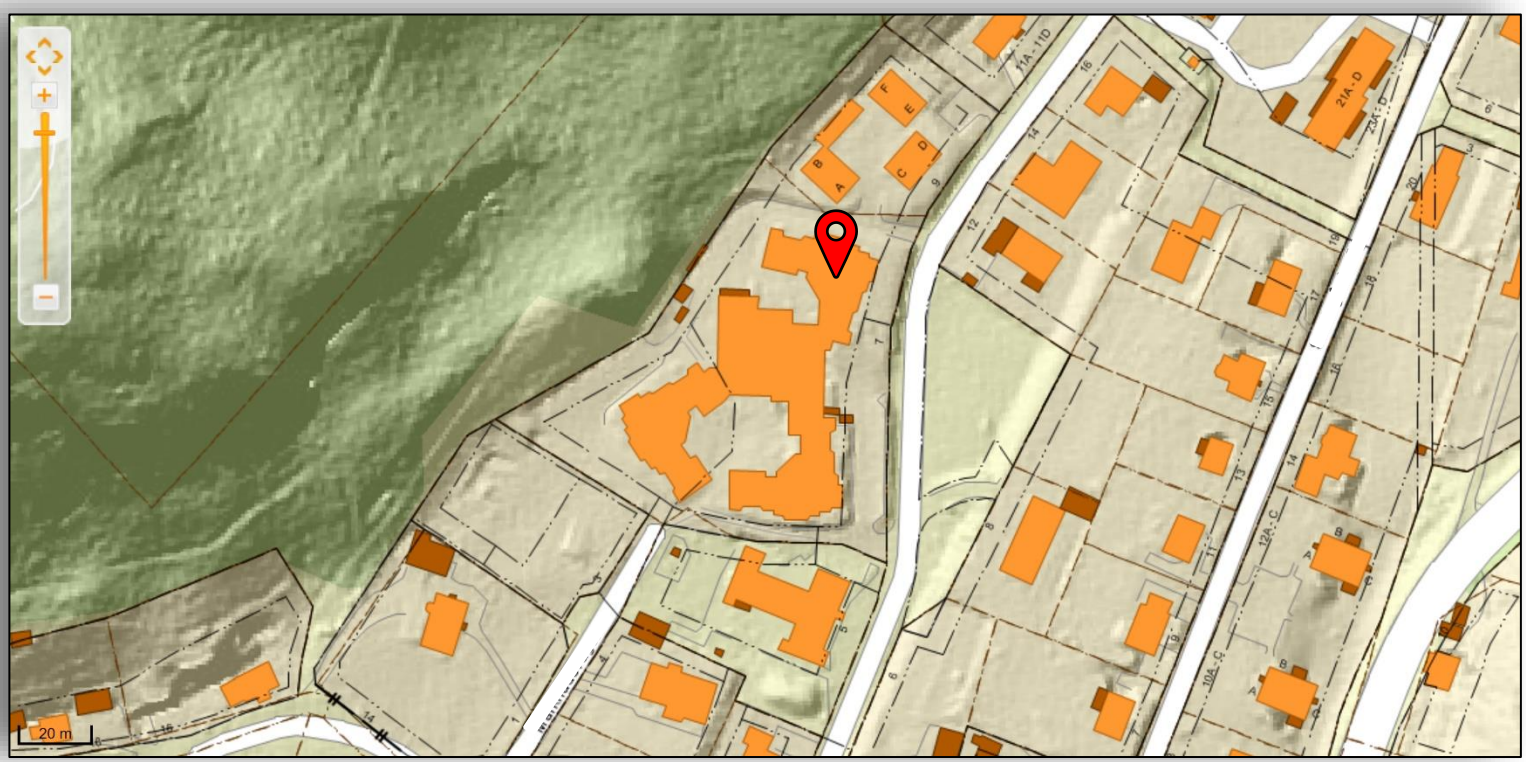
	Common living/dining area	Common area	Common outdoor area	Public outdoor area
"Comfortable design"				
1. Closeness and easy access	Position: (From the zone, perceived qualities for zone 3)	(From the zone, perceived qualities for zone 3)	(Present qualities in the current zone)	(Present qualities in the current zone)
a) visibility (zone 1 & 2)	1a 1b 2 3a 3b 4 5 6	1a 1b 2 3a 3b 4 5 6	1 2 3a 3b 4 5 6	1 2 3a 3b 4 5 6
b) accessibility (zone 1 & 2)	1a 1b 2 3a 3b 4 5 6	1a 1b 2 3a 3b 4 5 6	1 2 3a 3b 4 5 6	1 2 3a 3b 4 5 6
2. Enclosure	~~1a 1b 2 3a 3b 4 5 6~~	~~1a 1b 2 3a 3b 4 5 6~~	~~1 2 3a 3b 4 5 6~~	~~1 2 3a 3b 4 5 6~~
3. Safety and security	(!) beds are not used outside private rooms	(!) beds are not used outside private rooms	(!) beds are not used outside private rooms	(!) beds are not used outside private rooms
a) physical				
b) phycological				
4. Familiarity				
5. Orientation and wayfinding				
6. Different options in different kind of weather				

The outdoor environment can be experienced comfortably and safely from zones 1 & 2, with low or neglectable risk of negative impressions?	Zone 1	YES / NO
	Zone 2	YES / NO

	Common living/dining area	Common area	Common outdoor area	Public outdoor area
"Stimulating design"				
1. Contact with surrounding life	(From the zone, perceived qualities in zone 3&4)	(From the zone, perceived qualities in zone 3&4)	(Perceived or present qualities from the zone)	(Perceived or present qualities from the zone)
2. Social opportunities	1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13 (!) based on ability to enter forest.
3. Joyful and meaningful act.	1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13 (!) based on disability to entre forest
4. Culture and connection to past	1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13
5. Symbolism/reflection	(!) beds are not used outside private rooms	(!) beds are not used outside private rooms	(!) beds are not used outside private rooms	(!) beds are not used outside private rooms
6. Prospect				
7. Space				
8. Rich in species				
9. Sensual pleasures from nature				
10. Seasons changing in nature				
11. Serene				
12. Wild nature				
13. Refuge				

The furniture layout, e.g. dining table and chairs, in zones 1 & 2 is well customized to support contact with the outdoor environment?	YES / NO

5 Bengtsson, A. (2015) ***From experiences of the outdoors to the design of healthcare environments***. Doctoral Thesis, Swedish University of Agricultural Sciences, Alnarp.



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Care home 5.

Number of floors	**1**
Total number of accommodations	**42**
Number of accommodations in dementia units	**17**
Driving distance to Falkenberg city centre (km)	**32,5**
Perceived area configuration (urban, rural)	**Rural**

Zone 1

Zone 2

Zone 3

Zone 4

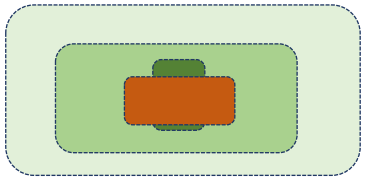


Fig 1. Model of the four zones of contact in subject x.

Care home 6.

- *Table based on the "Quality Evaluation Tool" – QET (Bengtsson, 2015)*[6]

	Zone 1	Zone 2	Zone 3	Zone 4
Overall description of zone	Zone 1 is situated at third floor (top floor) and consist of two living/dining rooms with windows and a glassed door leading out to balconies. The total area of windows and glassed doors is rather small compared to total wall area, however, they are placed in both southeast and northwest which enhance inflow of daylight. The view is somewhat limited, mostly due to balcony placement, but all the other zones are possible to observe from zone 1.	Zone 2 consists of two small opened balconies, approximately 10 square meters each. The protective fence is made of bars, thus its possible to see through but it doesn't protect from winds and other weather conditions. The zone reinforces the view of the surrounding other zones, it's even possible to recognize the ocean in the horizon.	Zone 3 isn´t well defined and goes together with the rest of the area, i.e. the pubic zone 4. However, around most of the building are small lawns and on the north side there is a paved area for social activities, with benches and tables. No protection from bad weather is available.	Zone 4 consist almost exclusively of an urban environment, which in this case means apartment-buildings, grocery store and a school in the south. In northwest there is public area, including a larger lawn of approximately 3500 square meters, small trees and a plane for boule.

Environmental qualities

Distinctly perceived or present
Vaguely perceived or present
Neither perceived or present

Position:	**Common living/dining area**	**Common area**	**Common outdoor area**	**Public outdoor area**
"Comfortable design" *1. Closeness and easy access* *a) visibility (zone 1 & 2)* *b) accessibility (zone 1 & 2)* *2. Enclosure* *3. Safety and security* *a) physical* *b) phycological* *4. Familiarity* *5. Orientation and wayfinding* *6. Different options in different kind of weather*	(From the zone, perceived qualities for zone 3)	(From the zone, perceived qualities for zone 3)	(Present qualities in the current zone)	(Present qualities in the current zone)
	1a 1b 2 3a 3b 4 5 6 1. a) + 2-6, few windows and balconies blocking sight. 1.b) Vague due to unit placement (3rd floor)	1a 1b 2 3a 3b 4 5 6 1.b) not possible to access zone 3 from zone 2.	1 2 3a 3b 4 5 6 1. Vague due to unit placement (3rd floor)	1 2 3a 3b 4 5 6 1. Vague due to unit placement (3rd floor)
	1a 1b 2 3a 3b 4 5 6 1. a) + 2-6, few windows and balconies blocking sight. 1.b) Vague due to unit placement (3rd floor)	1a 1b 2 3a 3b 4 5 6 1.b) not possible to access zone 3 from zone 2.	1 2 3a 3b 4 5 6 1. Vague due to unit placement on 3rd floor.	1 2 3a 3b 4 5 6 1. Vague due to unit placement on 3rd floor.
	~~1a 1b 2 3a 3b 4 5 6~~ (!) beds are not used outside private rooms	~~1a 1b 2 3a 3b 4 5 6~~ (!) beds are not used outside private rooms	~~1 2 3a 3b 4 5 6~~ (!) beds are not used outside private rooms	~~1 2 3a 3b 4 5 6~~ (!) beds are not used outside private rooms
The outdoor environment can be experienced comfortably and safely from zones 1 & 2, with low or neglectable risk of negative impressions?	Zone 1 YES NO Zone 2 YES NO		* no or very low protection from bad weather	
"Stimulating design" *1. Contact with surrounding life* *2. Social opportunities* *3. Joyful and meaningful act.* *4. Culture and connection to past* *5. Symbolism/reflection* *6. Prospect* *7. Space* *8. Rich in species* *9. Sensual pleasures from nature* *10. Seasons changing in nature* *11. Serene* *12. Wild nature* *13. Refuge*	(From the zone, perceived qualities in zone 3&4)	(From the zone, perceived qualities in zone 3&4)	(Perceived or present qualities from current zone)	(Perceived or present qualities from current zone)
	1 2 3 4 5 6 7 8 9 10 11 12 13 (!) Few windows and balconies blocking sight.	1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13
	1 2 3 4 5 6 7 8 9 10 11 12 13 (!) Few windows and balconies blocking sight.	1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13
	~~1 2 3 4 5 6 7~~ ~~8 9 10 11 12 13~~ (!) beds are not used outside private rooms	~~1 2 3 4 5 6 7~~ ~~8 9 10 11 12 13~~ (!) beds are not used outside private rooms	~~1 2 3 4 5 6 7~~ ~~8 9 10 11 12 13~~ (!) beds are not used outside private rooms	~~1 2 3 4 5 6 7~~ ~~8 9 10 11 12 13~~ (!) beds are not used outside private rooms
The furniture layout, e.g. dining table and chairs, in zones 1 & 2 is well customized to support contact with the outdoor environment?	YES NO			

6 Bengtsson, A. (2015) ***From experiences of the outdoors to the design of healthcare environments***. Doctoral Thesis, Swedish University of Agricultural Sciences, Alnarp.

Care home 6.

Number of floors	**3**
Total number of accommodations	**59**
Number of accommodations in dementia units	**19**
Driving distance to Falkenberg city centre (km)	**3**
Perceived area configuration (urban, rural)	**Urban**

Falkenberg kommunkarta. http://falkenberg.csm01.cartesia.se/cbkort?

Zone 1

Zone 2

Zone 3

Zone 4

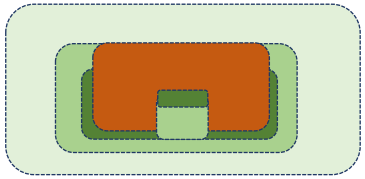


Fig 1. Model of the four zones of contact in subject x.

Care home 7.

- *Table based on the "Quality Evaluation Tool" – QET (Bengtsson, 2015)*[7]

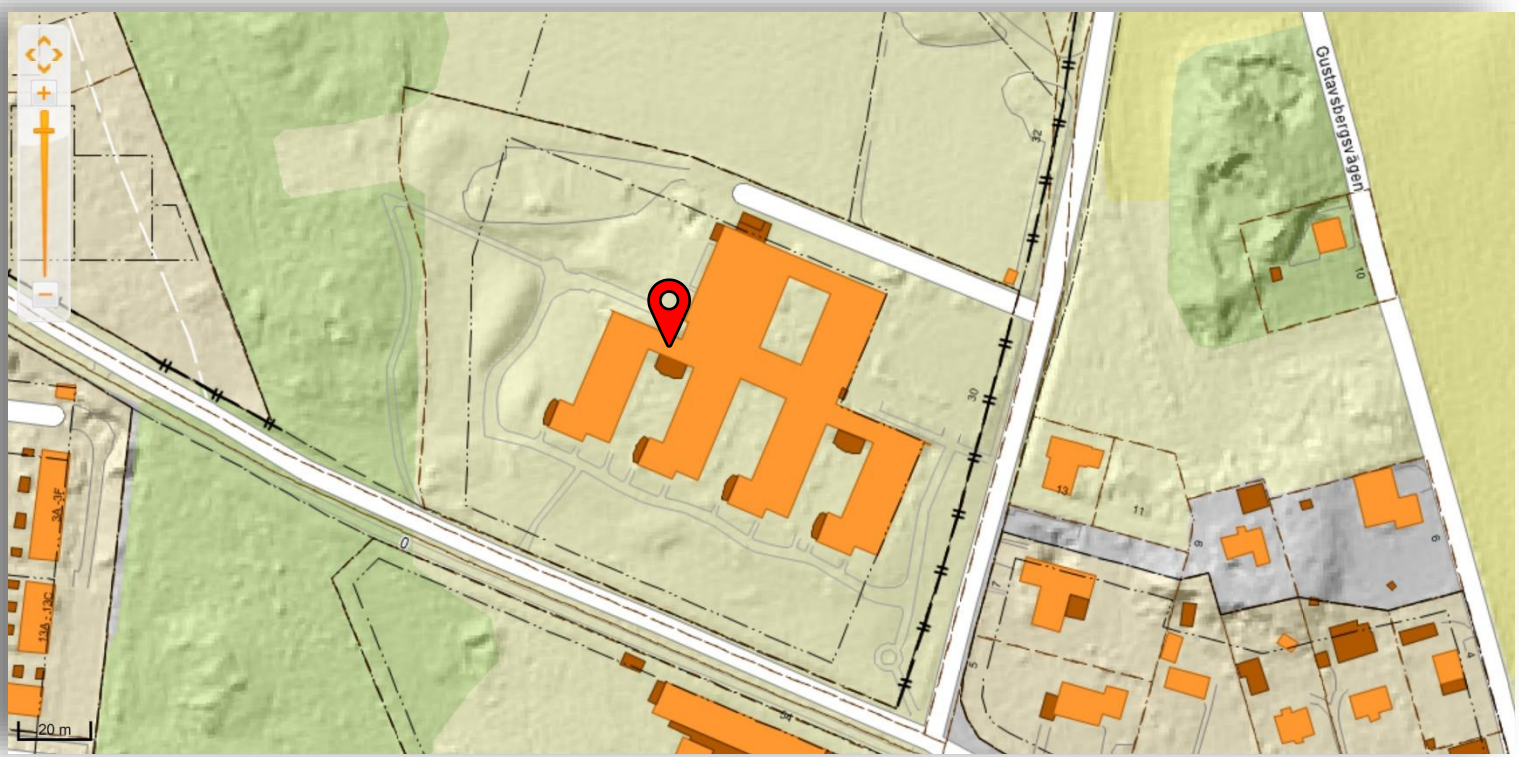
	Zone 1	Zone 2	Zone 3	Zone 4
Overall description of zone	Zone 1 is situated on ground floor in the building, which include both private and common areas. Each private room has large windows, some of the rooms also include and entrance/exit to a small patio outside, thus its possible for both sunlight and fresh air to reach the inside of the room. The common areas include large windows and glassed doors, which leads out to both zone 2 and 3, and overall the impression is easy access between the zones. Both common and private areas offer various views including the other zones and the building itself. **Pictures…**	Zone 2 is present adjacent to both private and common sections of the building. Outside most of the private rooms, there are small paved patios, facing all quarter but north, with a various view of zone 3 and 4. Although these patios have ceilings, they are not glassed, which are the case for the patios in the common area. The common patios are about 35 square meters and face a small part of the zone 3 which is protected between two expiring sections of the building. It is possible to reach zone 3 from the current zone. Pictures…	Zone 3 exist in connections with the care home building in east, south and west. Further, there is an atrium of 180 square meters in the centre of the building with no view of zone 4. Otherwise, the garden is divided in one larger section, about 8000 square meters, and three separated smaller sections, about 250 square meters, which are protected by building walls on three sides. The side without wall is enclosed by green fencing net and hedges, while the large part of the zone is partly surrounded by low hedges. Zone 4 are visible all around.	Zone 4 is a rather mixed composition of a oak grove and apartment buildings in the west, kindergarten in the south, villas in the east and a football field in the north. Low traffic roads are running alongside zone 3 in south and east, and parking lots are available north of the care home complex.

Environmental qualities

Distinctly perceived or present
Vaguely perceived or present
Neither perceived or present

	Common living/dining area	**Common area**	**Common outdoor area**	**Public outdoor area**
"Comfortable design" *1. Closeness and easy access* *a) visibility (zone 1 & 2)* *b) accessibility (zone 1 & 2)* *2. Enclosure* *3. Safety and security* *a) physical* *b) phycological* *4. Familiarity* *5. Orientation and wayfinding* *6. Different options in different kind of weather*	**Position:** (From the zone, perceived qualities for zone 3)	(From the zone, perceived qualities for zone 3)	(Present qualities in the current zone)	(Present qualities in the current zone)
	1a 1b 2 3a 3b 4 5 6 (!) View just include a smaller section of zone 3. 6. If including zone 2.	1a 1b 2 3a 3b 4 5 6 (!) View just include a smaller section of zone 3. 6, if zone 2 is included.	1 2 3a 3b 4 5 6 (!) Considerable variances within different sections of the zone. 6, if zone 2 is included.	1 2 3a 3b 4 5 6
	1a 1b 2 3a 3b 4 5 6 (!) View just include a smaller section of zone 3. 6. If including zone 2.	1a 1b 2 3a 3b 4 5 6 (!) View just include a smaller section of zone 3. 6, if zone 2 is included.	1 2 3a 3b 4 5 6 (!) Considerable variances within different sections of the zone. 6, if zone 2 is included.	1 2 3a 3b 4 5 6
	~~1a 1b 2 3a 3b 4 5 6~~ (!) Beds are not used outside private rooms.	~~1a 1b 2 3a 3b 4 5 6~~ (!) Beds are not used outside private rooms.	~~1 2 3a 3b 4 5 6~~ (!) Beds are not used outside private rooms.	~~1 2 3a 3b 4 5 6~~ (!) Beds are not used outside private rooms.
	The outdoor environment can be experienced comfortably and safely from zones 1 & 2, with low or neglectable risk of negative impressions?	Zone 1 **YES** **NO** Zone2 **YES** **NO**		
"Stimulating design" *1. Contact with surrounding life* *2. Social opportunities* *3. Joyful and meaningful act.* *4. Culture and connection to past* *5. Symbolism/reflection* *6. Prospect* *7. Space* *8. Rich in species* *9. Sensual pleasures from nature* *10. Seasons changing in nature* *11. Serene* *12. Wild nature* *13. Refuge*	(From the zone, perceived qualities in zone 3&4)	(From the zone, perceived qualities in zone 3&4)	(Perceived or present qualities from the zone)	(Perceived or present qualities from the zone)
	1 2 3 4 5 6 7 8 9 10 11 12 13 (!) Beds are not used outside private rooms.	1 2 3 4 5 6 7 8 9 10 11 12 13 (!) Beds are not used outside private rooms.	1 2 3 4 5 6 7 8 9 10 11 12 13 (!) Beds are not used outside private rooms.	1 2 3 4 5 6 7 8 9 10 11 12 13 4, football fields. (!) Beds are not used outside private rooms.
	1 2 3 4 5 6 7 8 9 10 11 12 13 (!) Beds are not used outside private rooms.	1 2 3 4 5 6 7 8 9 10 11 12 13 (!) Beds are not used outside private rooms.	1 2 3 4 5 6 7 8 9 10 11 12 13 (!) Beds are not used outside private rooms.	1 2 3 4 5 6 7 8 9 10 11 12 13 4, football fields. 5. Difficult to access oak-grove. (!) Beds are not used outside private rooms.
	~~1 2 3 4 5 6 7~~ ~~8 9 10 11 12 13~~ (!) Beds are not used outside private rooms.	~~1 2 3 4 5 6 7~~ ~~8 9 10 11 12 13~~ (!) Beds are not used outside private rooms.	~~1 2 3 4 5 6 7~~ ~~8 9 10 11 12 13~~ (!) Beds are not used outside private rooms.	~~1 2 3 4 5 6 7~~ ~~8 9 10 11 12 13~~ (!) Beds are not used outside private rooms.
	The furniture layout, e.g. dining table and chairs, in zones 1 & 2 is well customized to support contact with the outdoor environment?	**YES** **NO**		

[7] Bengtsson, A. (2015) ***From experiences of the outdoors to the design of healthcare environments***. Doctoral Thesis, Swedish University of Agricultural Sciences, Alnarp.



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Care home 7.

Number of floors	**2**
Total number of accommodations	**51**
Number of accommodations in dementia units	**25**
Driving distance to Falkenberg city centre (km)	**1,5**
Perceived area configuration (urban, rural)	**Rural**

Zone 1

Zone 2

Zone 3

Zone 4

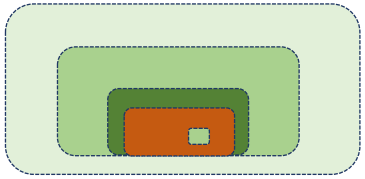


Fig 1. Model of the four zones of contact in subject x.

Care home 8.

- *Table based on the "Quality Evaluation Tool" – QET (Bengtsson, 2015)*[8]

	Zone 1	Zone 2	Zone 3	Zone 4
Overall description of zone	Zone 1 consists of two common living/dining room situated at two floors, ground floor (GF) and first floor (FF), one for each dementia unit. Overall, the windows are large and some them are possible to open, thus a high amount of daylight as well as fresh air and fragrance can reach the indoor environment. The windows offer a limited view over all the other zones. However, some corridors are lacking windows. Zone 2 and 3 are easily accessed from GF zone 1, but is a lite troublesome from FF due to distance etc. **Pictures…**	Zone 2 exists right outside zone 1 and both levels do have a 30 square meters glassed balcony/patio, which is centred in the building and facing zone 3 and 4. At ground level, the zone also include patios, which are linked to the garden, and glassed entrance (not directly connected to dementia unit) where it´s possible to reach the parking lot and further zone 4. In the garden there is also a small greenhouse. **Pictures…**	Zone 3, in terms of *green outdoor,* exists in south-east and to some extent at the west side of the building and as a small atrium with no view of zone 4. Beside the atrium, the zone consists of a "sensory" garden in the south south-east, enclosed by hedges/ green fencing net, in immediate contact with dementia care section. The zone includes a small pond, paved walking tracks, benches and in the summertime, there are chickens in the garden. The area is an open space with low vegetation and full transparency from zone 4. **Pictures…**	Most of the Zone 4, in all directions, consists of high aged and sparse pine forest, accessible via walking tracks. A kindergarten is situated next to the garden in zone 3, and It is possible for children to enter the nursing home garden. In the south the access road, a low traffic cobblestone street, is running west/east-direction. Close to the building in west and north, there is parking lots and roads. **Pictures…**

Environmental qualities

Distinctly perceived or present
Vaguely perceived or present
Neither perceived or present

"Comfortable design"

1. Closeness and easy access
a) visibility (zone 1 & 2)
b) accessibility (zone 1 & 2)
2. Enclosure
3. Safety and security
a) physical
b) phycological
4. Familiarity
5. Orientation and wayfinding
6. Different options in different kind of weather

Position:	**Common living/dining area** (From the zone, perceived qualities for zone 3)	**Common area** (From the zone, perceived qualities for zone 3)	**Common outdoor area** (Present qualities in the current zone)	**Public outdoor area** (Present qualities in the current zone)
	1a 1b 2 3a 3b 4 5 6 1. b) FF lower the overall grade due to distance to outdoor.	1a 1b 2 3a 3b 4 5 6 1. b) FF lower the overall grade due to distance to outdoor.	1 2 3a 3b 4 5 6	1 2 3a 3b 4 5 6
	1a 1b 2 3a 3b 4 5 6 1. b) FF lower the overall grade due to distance to outdoor.	1a 1b 2 3a 3b 4 5 6 1. b) FF lower the overall grade due to distance to outdoor.	1 2 3a 3b 4 5 6	1 2 3a 3b 4 5 6
	~~1a 1b 2 3a 3b 4 5 6~~ (!) beds are not used outside private rooms	~~1a 1b 2 3a 3b 4 5 6~~ (!) beds are not used outside private rooms	~~1 2 3a 3b 4 5 6~~ (!) beds are not used outside private rooms	~~1 2 3a 3b 4 5 6~~ (!) beds are not used outside private rooms

The outdoor environment can be experienced comfortably and safely from zones 1 & 2, with low or neglectable risk of negative impressions?			
	Zone 1	YES	NO
	Zone 2	YES	NO

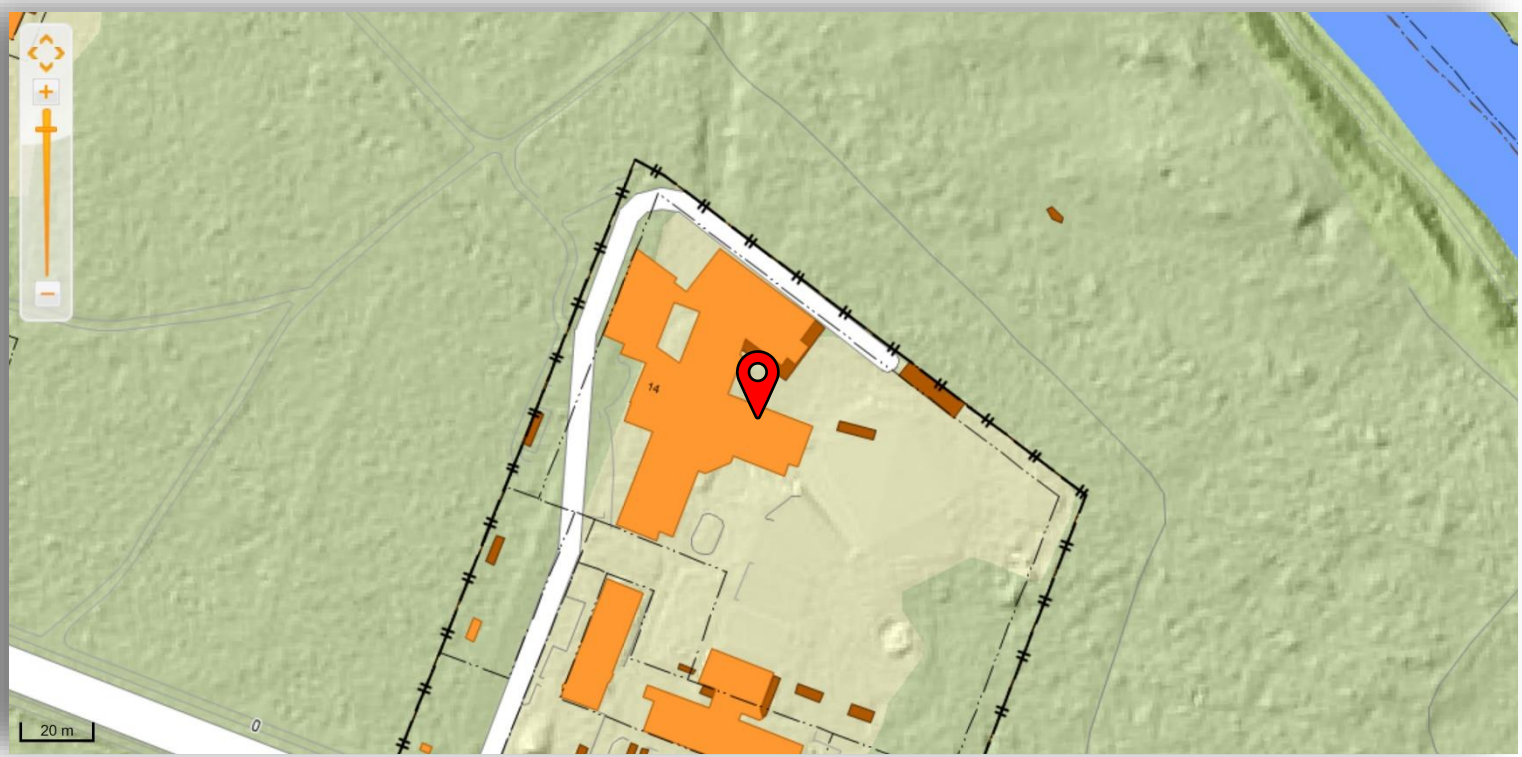
"Stimulating design"

1. Contact with surrounding life
2. Social opportunities
3. Joyful and meaningful act.
4. Culture and connection to past
5. Symbolism/reflection
6. Prospect
7. Space
8. Rich in species
9. Sensual pleasures from nature
10. Seasons changing in nature
11. Serene
12. Wild nature
13. Refuge

	(From the zone, perceived qualities in zone 3&4)	(From the zone, perceived qualities in zone 3&4)	(Perceived or present qualities from the zone)	(Perceived or present qualities from the zone)
	1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13
	1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13
	~~1 2 3 4 5 6 7~~ ~~8 9 10 11 12 13~~ (!) beds are not used outside private rooms	~~1 2 3 4 5 6 7~~ ~~8 9 10 11 12 13~~ (!) beds are not used outside private rooms	~~1 2 3 4 5 6 7~~ ~~8 9 10 11 12 13~~ (!) beds are not used outside private rooms	~~1 2 3 4 5 6 7~~ ~~8 9 10 11 12 13~~ (!) beds are not used outside private rooms

The furniture layout, e.g. dining table and chairs, in zones 1 & 2 is well customized to support contact with the outdoor environment?	YES	NO

8 Bengtsson, A. (2015) ***From experiences of the outdoors to the design of healthcare environments***. Doctoral Thesis, Swedish University of Agricultural Sciences, Alnarp.



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Care home 8.

Number of floors	**4**
Total number of accommodations	**80**
Number of accommodations in dementia units	**40**
Driving distance to Falkenberg city centre (km)	**1,2**
Perceived area configuration (urban, rural)	**Rural**

Zone 1

Zone 2

Zone 3

Zone 4

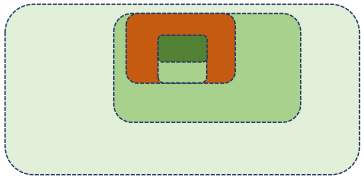


Fig 1. Model of the four zones of contact in subject x.

Care home 9.

- *Table based on the "Quality Evaluation Tool" – QET (Bengtsson, 2015)*[9]

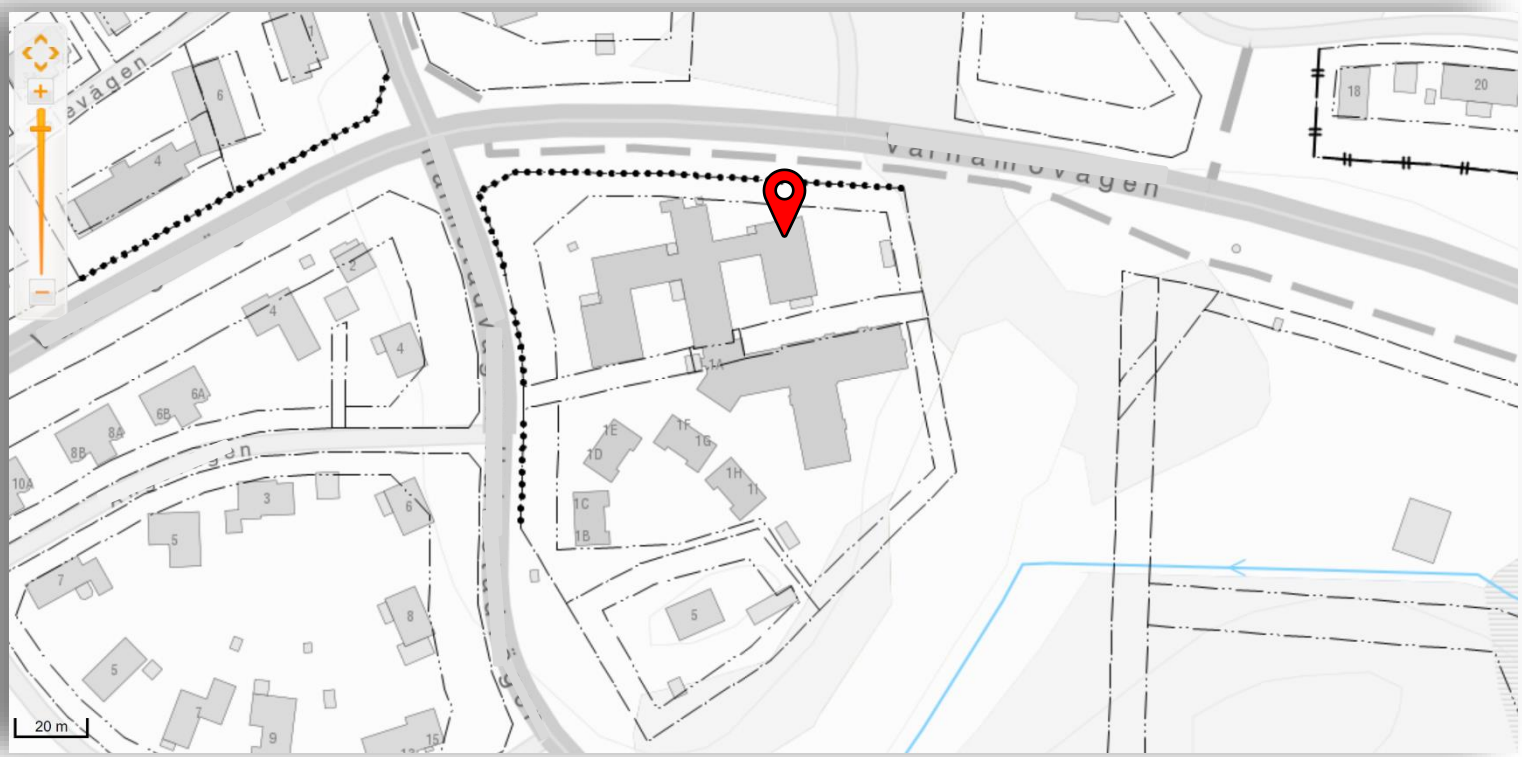
	Zone 1	Zone 2	Zone 3	Zone 4
Overall description of zone	Zone 1 consists of one living/dining room at ground floor. Window are facing a courtyard (zone 3) in the south and roads and villas in the north (zone 4). Windows are possible to open, thus a high amount of daylight as well as fresh air and fragrance can reach the indoor environment, and there is a glassed door leading out to the zone 3. Corridors adjacent to the zone are lacking windows.	Zone 2 is situated directly outside south of zone 1 and consist of a 50 square meters paved area without ceiling, though it is protected at three sides by the care home building. I the zone is directly linked to one enclosed part of zone 3, and the transfer between the zones is simple.	Zone 3 exist partly as a courtyard close to the centre of the building and directly outside zone 1 and 2. Further, it goes around the building in south and southeast, though these areas are rather limited/small in terms of zone 3 characteristics. The zone does have hard surfaces which make walking and handling of wheelchairs easy, bunches is placed at various locations. Greenery within the zone is rather limited.	Zone 4 consists of meadow and forest in south-southeast, and villas and roads in the other directions. In clear weather, the view over the meadows is rather fabulous. A lot of traffic is passing by at the nearby road in the north., making much noise.

Environmental qualities

Distinctly perceived or present
Vaguely perceived or present
Neither perceived or present

	Common living/dining area	**Common area**	**Common outdoor area**	**Public outdoor area**
Position:	(From the zone, perceived qualities for zone 3)	(From the zone, perceived qualities for zone 3)	(Present qualities in the current zone)	(Present qualities in the current zone)
"Comfortable design" *1. Closeness and easy access* *a) visibility (zone 1 & 2)* *b) accessibility (zone 1 & 2)* *2. Enclosure* *3. Safety and security* *a) physical* *b) phycological* *4. Familiarity* *5. Orientation and wayfinding* *6. Different options in different kind of weather*	1a 1b 2 3a 3b 4 5 6 1a 1b 2 3a 3b 4 5 6 ~~1a 1b 2 3a 3b 4 5 6~~ (!) beds are not used outside private rooms	1a 1b 2 3a 3b 4 5 6 1a 1b 2 3a 3b 4 5 6 ~~1a 1b 2 3a 3b 4 5 6~~ (!) beds are not used outside private rooms	1 2 3a 3b 4 5 6 1 2 3a 3b 4 5 6 ~~1 2 3a 3b 4 5 6~~ (!) beds are not used outside private rooms	1 2 3a 3b 4 5 6 1 2 3a 3b 4 5 6 ~~1 2 3a 3b 4 5 6~~ (!) beds are not used outside private rooms
The outdoor environment can be experienced comfortably and safely from zones 1 & 2, with low or neglectable risk of negative impressions?	Zone 1 YES NO Zone 2 YES NO		* Zone 2 provide no shelter for bad weather.	
"Stimulating design" *1. Contact with surrounding life* *2. Social opportunities* *3. Joyful and meaningful act.* *4. Culture and connection to past* *5. Symbolism/reflection* *6. Prospect* *7. Space* *8. Rich in species* *9. Sensual pleasures from nature* *10. Seasons changing in nature* *11. Serene* *12. Wild nature* *13. Refuge*	(From the zone, perceived qualities in zone 3&4) 1 2 3 4 5 6 7 8 9 10 11 12 13 1 2 3 4 5 6 7 8 9 10 11 12 13 ~~1 2 3 4 5 6 7~~ ~~8 9 10 11 12 13~~ (!) beds are not used outside private rooms	(From the zone, perceived qualities in zone 3&4) 1 2 3 4 5 6 7 8 9 10 11 12 13 1 2 3 4 5 6 7 8 9 10 11 12 13 ~~1 2 3 4 5 6 7~~ ~~8 9 10 11 12 13~~ (!) beds are not used outside private rooms	(Perceived or present qualities from the zone) 1 2 3 4 5 6 7 8 9 10 11 12 13 1 2 3 4 5 6 7 8 9 10 11 12 13 ~~1 2 3 4 5 6 7~~ ~~8 9 10 11 12 13~~ (!) beds are not used outside private rooms	(Perceived or present qualities from the zone) 1 2 3 4 5 6 7 8 9 10 11 12 13 1 2 3 4 5 6 7 8 9 10 11 12 13 ~~1 2 3 4 5 6 7~~ ~~8 9 10 11 12 13~~ (!) beds are not used outside private rooms
The furniture layout, e.g. dining table and chairs, in zones 1 & 2 is well customized to support contact with the outdoor environment?	YES NO			

9 Bengtsson, A. (2015) ***From experiences of the outdoors to the design of healthcare environments***. Doctoral Thesis, Swedish University of Agricultural Sciences, Alnarp.



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Care home 9.

Number of floors	**1**
Total number of accommodations	**31**
Number of accommodations in dementia units	**7**
Driving distance to Falkenberg city centre (km)	**42,3**
Perceived area configuration (urban, rural)	**Rural**

Zone 1

Zone 2

Zone 3

Zone 4

3.3. BPSD and outdoor environment qualities

Overall, the outdoor environment assessment, using the *outdoor evaluation chart - dementia care*, distinguished the care homes in accordance to design of outdoor environments and buildings Assuming the 19 environmental qualities, some sites managed to meet the requirements to an overall high degree, e.g. care *home 8*, while some were missing most of the qualities of interest, e.g. *care home 4* and *care home 6*.

Correlations between the BPSD registry data and the results of outdoor environment assessment were initially hard to find. For instance, no obvious correlation between utilization of the care measure *outdoor stay* and degree of environmental qualities could be found in this stage. However, if quantifying the colour assessment – implying to translate *green* to *2*, *yellow* to *1* and *red* to *0* – a potential correlation occurs between degree of the 19 environmental qualities in zone 3 and tendency of BPSD (figure 24), i.e. the amount of increase or decrease in BPSD. In this case, higher score regarding zone 3 indicates a higher percentage of decrease in BPSD. Due to a low number of patients, here defined bellow 15, only six care homes were included in the diagram. Additionally, the correlation isn't analysed for significance or causation, and should only be considered as a potential tendency between the two datasets.

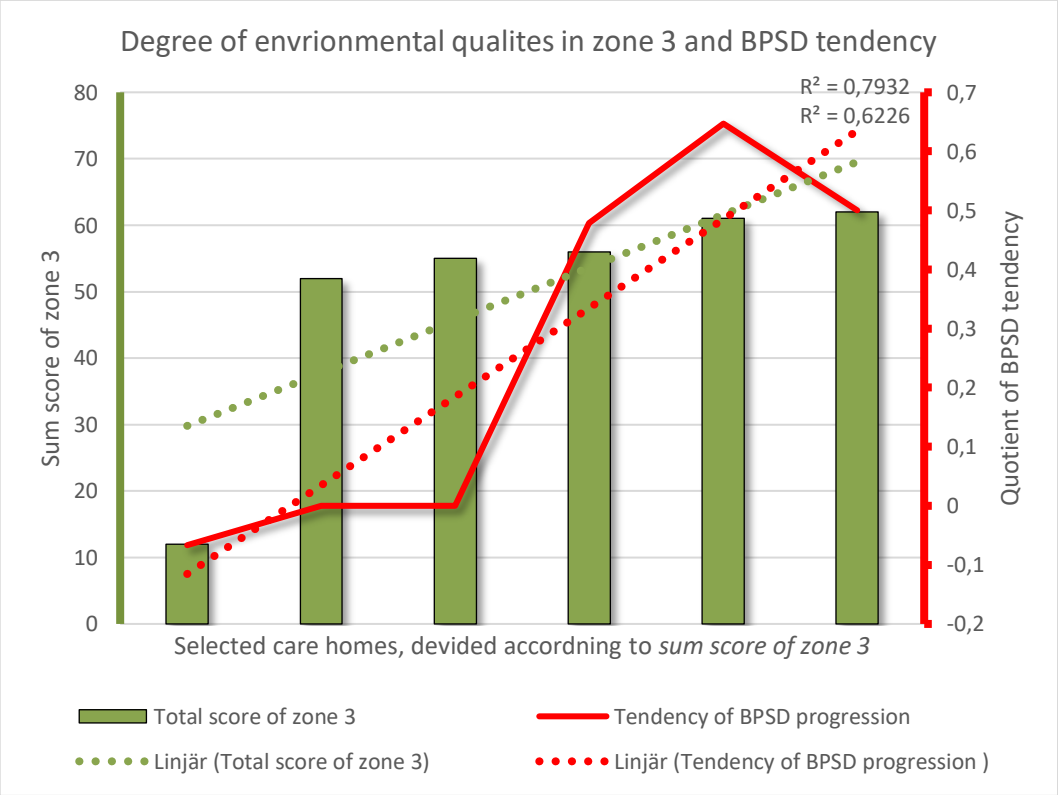

Figure 24. Sum score of environmental qualities in zone 3 and tendency of BPSD progression.

4. Discussion

In the following chapter the previous results are discussed based on the project´s aim. That is, exploring if the data in the Swedish BPSD-registry is sufficient to cover for rational and large-scale analysis's, which target to investigate the effects of outdoor stay in terms of BPSD. Also, evaluating the method and potential of outdoor environment assessment in relation to BPSD. The discussion follows the same chronological order as the result´s presentation in chapter 3

4.1. Statistics in the Swedish BPSD registry

The Swedish BPSD registry is a large organization. Established 2010, it nowadays covers all municipalities in Sweden and includes data related to patient suffering from dementia, collected in both home care services and dementia care homes. In the beginning of 2019, the total amount of data was related to somewhat 60 000 patients, divided in 91 variables, including all measurement scales; nominal, ordinal, interval and ratio (table 4.). The people involved in the organization of the Swedish BPSD registry appear to be very professional and the process of ordering and receiving data were simple and effective. In the case of this specific project, two categories of variables were of certain interest; the care measure *outdoor stay* and the 12 neuropsychiatric disorders in dementia defined by NPI-NH (Wood *et al.*, 2000), including; 1. delusions, 2. hallucinations, 3. agitation/aggression, 4. depression/dysphoria, 5. anxiety, 6. elation/euphoria, 7. apathy/indifference, 8. disinhibition, 9. irritability/lability, 10. aberrant motor behaviour (restlessness), 11. sleep and night-time behaviour disorders and 12. appetite and eating disorders. In total, nationally, around 42 500 patients have been given *outdoor stay* and around 17 000 haven't received the care measure. To this point, the registry seems to be qualified for large epidemiologic studies, regarding to its great size related to dementia care measures documentations and BPSD observations.

The BPSD organization recommend follow-up 4-6 weeks after registration and the national board of healthcare requires follow up at least once every year (BPSD-registry, 2015). If this requirement were met or not wasn't concluded in this examination, however, it´s clear that there are a variety of gaps between registrations/follow-ups. Such conditions make the data material somewhat difficult and time consuming to process and, in this project, when comparing first and last registration of BPSD total score, the time-gap between registrations hasn't been considered. Some research indicates the progression of BPSD to be rather stable- or slow developing

over time (Helvik *et al.*, 2018) and thus the aspect of time, as well as a defined baseline, might not be crucial for investigations which are intended to illustrate only the tendency of BPSD progression in a population, i.e. the amount of patient which are worsening or improving in their disease. That is if the gaps aren't disproportionately small for any changes to occur. On the other hand, if the scores from any of 12 neuropsychiatric disorders, provided by the NPI-NH, are used to determine the weight of the result, i.e. how strong the tendency are, it´s natural to consider the time-gaps. If not, groups of patients might include different amount of total time from first- to last registration, which probably will affect the balance and the result would be misleading. The registry presents dates for all registrations, which should be considered and more firmly worked through in future research projects.

4.1.1. Course of BPSD and *Outdoor stay* in Falkenberg´s care homes

Some of the descriptive results presented in chapter 3 illustrates examples of comparations which might be affected by the parameter of time, e.g. figure 10. That is, if the different groups, in this case extracted from the sample (Falkenberg) according to *outdoor stay*, contain different amount of time between first and last registration, the result could be misinterpreted, and, in worst case, time between registration could be the determining variable. However, the descriptive diagrams above aren't supposed to be interpreted as a conclusion of the reality, instead they should be seen as a potential indication of the central tendency, i.e. how outdoor stay affect BPSD. Further, they should act as guidance when choosing measurement when or if performing future project. Moreover, the care measure *outdoor stay* occurs in a variety of frequencies, from 1 to 7 times per week. A fact that aren't considered in this specific project, but indeed could create opportunities for deepened analysis of the care measure.

Even though the aspect of time is missing in the comparation of mean- and median changes of BPSD from first to last registration in figures 14-17, they reveal an interesting fact – the change of mean and median are pointing in different directions. Traditionally, the median is accepted in descriptive analysis but the mean value are used when analysing the statistical material (Körner, 2012). However, some scientist question this traditional course of action (Cederquist, 2015). In this specific case, the median seems to be more appropriate, due to extreme values/outliers, and might be considered even in the analytical part when comparing regression between different groups and testing datasets for significant correlations. Moreover, the diversity of the mean, including a wide standard deviation, and median indicates the material to be of non-normal distribution (figure 11 and figure 13) and non-parametric test for analysing the data might be required, a fact that must be considered in future projects. As mentioned above, methods which only

explore the tendency of either increase or decrease in BPSD, are possible to use and should be less sensitive for some of the issues discussed in the section above.

On the contrary, the result indicates that the sum score of individual changes, from first to last registration, in total score of BPSD are very close to normal distributed and parametric tests might be possible. As demonstrated in the result, the mean value of these registrations shows an advantage of **not** take part in the care measure *outdoor stay*, whereas the median demonstrates the opposite. The same pattern emerges when only including the values of change which indicate decrease, i.e. improvement, of symptoms. However, when estimating the interquartile statistical values, the changes of mean and median demonstrates the same tendency. In this case the favour goes to the group of *outdoor stay*. In other words, the trimmed mean (25%) value indicates greater improvements for those which are subjects to *outdoor stay*. These findings suggest, as previous research (Whall *et al.*, 1997; Whear *et al.*, 2014; Uwajeh, Polay and Onosahwo Iyendo, 2018), that the outdoors can reduce symptoms from BPSD. Still, and clarifying, these results are only to be interpreted as an indication, tendency, of the actual situation. However, the findings related to the benefits of using the interquartile values should contribute to design of future projects. Further, upcoming investigations need to analyse the comparability of groups that has undergone *outdoor stay* and those which haven't, a crucial question for the reliability of the result. The actual composition of the care measure *outdoor stay* is another area of interest, which should be possible to understand by analysing samples from sections of *free text* found in the registry.

4.1.2. Falkenberg´s care homes in the BPSD registry

The data related to the total score of BPSD, collected from the dementia care homes in Falkenberg, are somewhat extreme and doesn't follow the patterns in neither Sweden, based in the BPSD registry (BPSD-registret, 2019) nor in countries close to us (Helvik *et al.*, 2018). Thus, the sample, i.e. care homes in Falkenberg, doesn't appear to be appropriate for any type of generalisation. Additionally, the sample is rather small and became even smaller when certain attributes, like number of registrations, were sorted out. Such pattern will continue and become even more crucial when sampling attributes are narrowed. This should be a lesson learned and be taken into account for future sampling. However, if upcoming sample in future project are of the same character, i.e. extreme, a way of action would be to divide the BPSD in subgroups psychosis (including the sum-score of delusions/dysphoria and hallucination), agitation (including the sum-score of agitation/aggression, disinhibition and irritability), and affective (including the sum-score of depression and anxiety), a method used in earlier studies (Selbæk and Engedal, 2012), which also would make the result more comparable with previous research. This action lowers

the sum score scale, from 0-144 to 0-24 and 0-36. Additionally, a sum-score significance level of 4 or higher (Steinberg *et al.*, 2004) gives even more compact data.

Although the care homes in Falkenberg never was attended to act as a generalizable sample of the total population in the BPSD registry, questions rise when the results tend to deviate from the general picture in the country (BPSD-registret, 2019). Moreover, even if the average number of patients, with at least two registrations, in the dementia care homes is rather low, it still indicates a substantial variance of BPSD between the care homes. These circumstances deserve attention and should be examined to determine if they are a result of natural variation or have other causes. For example, the process of registration, i.e. the session where BPSD is evaluated, should be firmly investigated to predict the inter-rater reliability and to search for systematic errors. Random errors, however, are predicted to become less important in a larger sample. For a start, observational studies including the process of registration could be appropriate if to determine dissimilarities between dementia units as well as regions in the country. Additionally, as the registry is rather extensive, both in numbers of participants and range of variables, the conditions are assumed to be decent when controlling correlations for potential confounders. Further, if correlations appear to be reliable, controlled interventions should be the next step in line when trying to conclude causation.

4.2. Outdoor environment assessment - Falkenberg´s dementia care homes

The *Outdoor evaluation chart - dementia care*, based on QET (Bengtsson *et al.*, 2018), became a rather simple and effective tool to use when evaluating outdoor environments at the dementia care homes in Falkenberg. The usability is essential if such evaluation method should be used in future larger scale studies, and the chart appears to meet requirements. Although, the tool aren´t tested for neither reliability nor validity and some preferences, e.g. from which perspective the assessor should observe and define the zones, are still unclear. Therefore, it needs more work to increase its ability to deliver the kind of data necessary for future research. In this specific case, however, the *Outdoor evaluation chart - dementia care unit* are estimated to contribute to the projects aim in terms of distinguish the care homes evidence based outdoor characteristics and further, together with the dataset from the BPSD registry, reveal tendency between outdoor environment and BPSD progression (figure x). That is, a higher presence of the 19 environmental qualities in zone 3 indicates a covariance with the number of patients which are getting less BPSD, i.e. improving from first to last registration. Though, this is only an indication of a potential correlation, thus, not a proven causation between the variables.

The benefit of the tool lies within its simplicity and its ability to provide a comprehensive overall picture of the environmental situation at each evaluated care home, attributes which are related to the projects aim. The colour setting improves a general understanding, i.e. people without any experience of environmental analyses can grasp level of supporting and stimulating design within the care home´s environment; green indicate a high level and red indicates a low level. Further, and as illustrated in the example above, it appears that the environmental qualities could be quantified, which would be advantageously in larger epidemiological studies. However, before getting to that point, the *Outdoor evaluation chart – dementia care unit* needs to be further developed and tested for both reliability and validity. An interesting and rather simple beginning for such arrangement would be to test how the repeatability appears, a move which would include just myself and the previous work processed in this project. In other words, I could do the evaluations once again and compare the results. Another question at issue is the aspect of seasonal changes, i.e. should the purpose of the tool be to evaluate the present and actual environmental appearance, whether it´s winter or summer, or should the assessor try to estimate the outdoors full potential, even if the location is covered in a thick layer of snow. In this case, the latter option was utilized when doing the evaluations, although, afterwards it appears to be the less thoughtful alternative. The registrations of BPSD are performed all year round and therefore, most logically, research that are supposed to concretize the relationship between outdoor environments and BPSD progression should pay attention to how seasonal changes affect the appearance of the environmental qualities. It is recommended that future testing affirm the different seasons, further, the *Outdoor evaluation chart – dementia care unit* should include a section for the matter.

4.3. Methodological reflections

I was familiar with the Swedish BPSD registry through my previous work as a physiotherapist at the municipality of Falkenberg, but its content as well as the procedures for data disclosing was for me rather unknow. Therefore, I believe the approach, where only the potential of the registry was investigated, was called for. The approach was suggested by the project´s supervisors and firmly discussed before applied. It opened for a wider view of the registry and gave an opportunity to apply the outdoor environmental evaluation, which could be tested against registry dataset. Moreover, the BPSD registry dataset turned out to be rather large and somewhat complex for an inexperienced eye, and just getting familiar with the data consumed a lot of time.

The choice to implement the project in Falkenberg, using all the care homes available, was both of good and bad. It facilitated the project progress thanks to the contact network, e.g. the municipal dementia coordinator, and I think my previous employment at the municipality contributed to increase the confidence and credibility in my work. However, working within my own home municipality may also increase the risk of bias, i.e. my work becomes coloured due to my previous experience of some of the care homes. This is a professional issue, which I had to keep in mind during the whole project process.

Getting back to *using **all** the care homes available,* regarding data collection from both the BPSD registry and the environmental evaluation. This course of action was partly motivated by an aspect of a census. That is, using all care homes in the municipality instead of a few, gives a fairer picture of the BPSD statistics and further an idea of the data material´s extent in relation to the municipality population. In the aspect of the environmental evaluations, a great number of care homes, including the outdoors, provides more testing of the evaluation methods and could probably lead to higher validity.

The tool used for outdoor evaluation, *the outdoor evaluation chart – dementia care,* are based on the QET-tool, but except from that it´s completely untested. This is something that may be questioned, and that´s for good reasons. Without a proper introduction to environmental analyses and previous knowledge of the target group, the tool´s reliability is estimated to be rather low. However, in this case I'm the only one preforming these evaluations, therefore, the estimated reliability are considered to be satisfactory and the results from the different care homes are assumed to be comparable with each other. Moreover, the purpose of *the outdoor evaluation chart – dementia care* wasn't only related to collecting data, it was also targeting to contribute to a new way of presenting results which would be easy to overview for people both in- and outside the university sphere.

The methods I use don't give any definitive conclusions about the situations in neither Falkenberg nor Sweden, instead, this course of action estimate the potential use of the Swedish BPSD registry in health-related environmental studies and might contribute to new ideas for future research approaches. I believe that my role as physiotherapist and further my interest in dementia can provide a new insight to the scientific field of landscape architecture and EBD. My close relationship to the municipality of Falkenberg creates good conditions for the academic work to be implemented and tested in real life conditions. Further, I belong to the paramedical discipline where there is a long tradition of non-medical treatments and therefore this kind of work is suitable for my profession. Though, this tradition doesn't interfere with my professional capability to communicate on the same level with more medicine focused professions, such as doctors and nurses, and thus there is decent circumstances for interdisciplinary cooperation.

4.4. Conclusions

This study of the BPSD registry is considered as the first of its kind, i.e. linking BPSD and outdoor environment. Unfortunately, it can neither confirm nor reject the suggestion of the Swedish BPSD registry´s ability to cover for rational and large-scale analysis's, which aim to investigate the effects of *outdoor stay* in terms of BPSD. However, the result confirms that the registry includes a large amount of data and an impressive set of variables, which further indicates the registry's potential, although unconfirmed, in future research linked to dementia, including environmental studies. The registry requires new assessments, including both quantitative and qualitative approaches, to come closer to any concluding statements about its full potential. Suggestion in the matter can be found in the discussion above.

The interpretation of QET led to the design of *Outdoor evaluation chart – dementia care*, which in turn could contributed as a method to evaluate the outdoor environment conditions and characteristics and lead to an improved general understanding about the relationship between outdoor environment and EBD. Also, together with data from the Swedish BPSD registry, the evaluation chart might bring some understanding to a potential correlation between BPSD progression and environmental qualities. However, more testing for validity and reliability is required.

4.5. Epilogue

Although research has suggested the benefits of EBD in healthcare settings (Sadler *et al.*, 2011) and further acknowledged nature´s ability to positively influence the progression of BPSD (Uwajeh, Polay and Onosahwo Iyendo, 2018), it´s up to governing politicians to make the final calls. However, to do so they need comprehensive, yet transparent, management information. Even if some of the Swedish BPSD registry´s limits and possibilities still are shrouded in obscurity, the registry does possess a potential to contribute with a powerful amount of data linked to dementia care. Adding an environment assessment tool which allow for large scale assessment, possible to quantify, and there might be great impact on upcoming management of dementia healthcare setting. Together, these two attributes have the potential to create a rich informational source to motivate future EBD investments in dementia care.

5. References

Bengtsson, A. (2015) *From experiences of the outdoors to the design of healthcare environments a phenomenological case study at nursing homes.* Department of Work Science, Business Economics and Environmental Psychology, Swedish University of Agricultural Sciences, Alnarp.

Bengtsson, A. and Grahn, P. (2014) 'Outdoor environments in healthcare settings: A quality evaluation tool for use in designing healthcare gardens', *Urban Forestry & Urban Greening,* 13(4).

Bengtsson, A., Oher, N., Åshage, A., Lavesson, L. and Grahn, P. (2018) 'Evidensbaserad design av utemiljö i vårdsammanhang'. Available: SLU.

Blake, M. and Mitchell, G. (2016) 'Horticultural therapy in dementia care: a literature review', *Nursing standard (Royal College of Nursing (Great Britain): 1987),* 30 (21).

Bowler, D. E., Buyung-Ali, L. M., Knight, T. M. and Pullin, A. S. (2010) 'A systematic review of evidence for the added benefits to health of exposure to natural environments', *BMC Public Health,* 10.

BPSD (2019) *Welcome to the Swedish BPSD register*. www.bpsd.se: Swedish BPSD registry. Available at: http://www.bpsd.se/in-english/ (Accessed: 15-01 -2019).

BPSD-registret (2019) *Kvalitetsindikatorer*. www.bpsd.se: Swedish BPSD registry. Available at: https://pharos.skane.se/ki/ (Accessed: 08-05 -2019).

BPSD-registry (2015) *Utbildningsmaterial BPSD-registret (administratörer).* Swedish BPSD registry.

BPSD-registry (2018) *Riktlinjer för utlämnande av data från BPSD-registret*. www.bpsd.se: Swedish BPSD registry. Available at: http://www.bpsd.se/wp-content/uploads/2018/12/Riktlinjer-f%C3%B6r-utl%C3%A4mnande-av-data-fr%C3%A5n-BPSD-2018-10-30-Hemsidan.pdf (Accessed: 04-12 2019-).

Bucht, C., Bylund, J. and Norlin, J. (2000) *Långtidsutredningen 1999/2000: [LU]. Bilaga 9, En åldrande befolkning : konsekvenser för svensk ekonomi.* Stockholm: Stockholm: Fritzes offentliga publikationer.

Cederquist, E. (2015) *Medianen ett mer exakt mätvärde än medelvärdet*. ki.se: Karolinska Institutet. Available at: https://ki.se/forskning/medianen-ett-mer-exakt-matvarde-an-medelvardet (Accessed: 05-05 -2019).

Cummings, L. J., Mega, A. M., Gray, A. K., Rosenberg-Thompson, A. S., Carusi, A. D. and Gornbein, A. J. (1994) 'The Neuropsychiatric Inventory: Comprehensive assessment of psychopathology in dementia', *Neurology,* 44 (12).

Dua, T., Seeher, K. M., Sivananthan, S., Chowdhary, N., Pot, A. M. and Saxena, S. (2017) 'World health organization's global action plan on the public health response to dementia 2017-2025', *Alzheimer's & Dementia,* 13 (7).

Edhag, O. and Norlund, A. (2006) 'Dementia diseases--a systematic review. SBU's summary and conclusions', *Lakartidningen,* 103(28-29).

Ewert, A. W., Mitten, D. and Overholt, J. (2013) *Natural environments and human health. Oxfordshire, England ;: CAB International.*

Folkhälsomyndigheten (2018) *Medellivslängd*. folkhälsomyndigheten.se: Folkhälsomyndigheten. Available at: https://www.folkhalsomyndigheten.se/folkhalsorapportering-statistik/folkhalsans-utveckling/halsa/medellivslangd/ (Accessed: 14-01 -2019).

Grahn, P. and Ottosson, Å. (2010) *Trädgårdsterapi: Alnarpsmetoden: att ta hjälp av naturen vid stress och utmattning.* Stockholm: Bonnier Existens.

Grahn, P. and Stigsdotter, U. K. (2010) 'The relation between perceived sensory dimensions of urban green space and stress restoration', *Landscape and Urban Planning,* 94(3).

Greenberg, M. S., Tanev, K., Marin, M.-F. and Pitman, R. K. (2014) 'Stress, PTSD, and dementia', *Alzheimer's & Dementia,* 10(3, Supplement).

Görman, U. (2013) *Frågor om behovet av etikprövning för forskningsförberedande arbeten som utförs av studenter*. Lund: Regionala Etikprövningsnämnden. Available at: https://www.forskningsetik.lu.se/sites/forskningsetik.lu.se/files/gorman_130302.pdf (Accessed: 12-04 -2019).

Hamilton, D. K. and Watkins, D. H. (2009) *Evidence-based design for multiple building types.* Architectural Science Review 52 (3) p.239–240.

Helvik, A.-S., Selbæk, G., Šaltytė Benth, J., Røen, I. and Bergh, S. (2018) 'The course of neuropsychiatric symptoms in nursing home residents from admission to 30-month follow-up', *PloS one,* 13 (10).

Huisman, E. R. C. M., Morales, E., Van Hoof, J. and Kort, H. S. M. (2012) 'Healing environment: A review of the impact of physical environmental factors on users. (Report)', *Building and Environment,* 58.

Johansson, L., Guo, X., Waern, M., Östling, S., Gustafson, D., Bengtsson, C. and Skoog, I. (2010) 'Midlife psychological stress and risk of dementia: a 35-year longitudinal population study', *Brain*, 133(8).

Körner, S. (2012) *Praktisk statistik.* 4., [rev.] uppl. Lund: Studentlitteratur.

Nilsson, K. (2011) *Forests, trees and human health.* New York: Springer Verlag.

Sadler, B., Berry, L., Guenther, R., Hamilton, D., Hessler, F., Merritt, C. and Parker, D. (2011) 'Fable Hospital 2.0: The Business Case for Building Better Health Care Facilities', *The Hastings Center Report*, 41(1).

SCB (2016) *Livslängden i Sverige 2011-2015: livslängdstabeller för riket och länen = [Life expectancy in Sweden 2011-2015: life tables at national and county level]*. Stockholm: Statistiska centralbyrån.

SCB (2018) *Återstående medellivslängd vid födelsen och vid 65 år efter kön 1970–2017 samt framskrivning 2018–2070*. sbc.se: Statistiska Centralbyrån. Available at: https://www.scb.se/hitta-statistik/statistik-efter-amne/befolkning/befolkningsframskrivningar/befolkningsframskrivningar/pong/tabell-och-diagram/aterstaende-medellivslangd-vid-fodelsen-och-vid-65-ar-efter-kon-19702017-samt-framskrivning-20182070/ (Accessed: 14-01 -2019).

Selbæk, G. and Engedal, K. (2012) 'Stability of the factor structure of the Neuropsychiatric Inventory in a 31-month follow-up study of a large sample of nursing-home patients with dementia', *Int. Psychogeriatr.*, 24 (1).

Sharp, B. K. (2017) 'Stress as experienced by people with dementia: An interpretative phenomenological analysis', *Dementia (London, England)*. [Online] 1471301217713877

Socialstyrelsen (2010) *Nationella riktlinjer för vård och omsorg vid demenssjukdom 2010: stöd för styrning och ledning.* Stockholm: Socialstyrelsen.

Socialstyrelsen (2014). *Demenssjukdomarnas samhällskostnader i Sverige 2012*. Stockholm: Socialstyrelsen.

Socialstyrelsen (2016a) *Nationella riktlinjer för vård och omsorg vid demenssjukdom - Rekommendationer med tillhörande kunskapsunderlag.* Stockholm: Socialstyrelsen.

Socialstyrelsen (2016b) *Nationella riktlinjer för vård och omsorg vid demenssjukdom : stöd för styrning och ledning.* Stockholm: Socialstyrelsen.

Steinberg, M., Shao, H., Zandi, P., Lyketsos, C. G., Welsh-Bohmer, K. A., Norton, M. C., Breitner, J. C. S., Steffens, D. C. and Tschanz, J. T. (2008) 'Point and 5-year period prevalence of neuropsychiatric symptoms in dementia: the Cache County Study', *International journal of geriatric psychiatry*, 23 (2).

Steinberg, M., Tschanz, J. T., Corcoran, C., Steffens, D. C., Norton, M. C., Lyketsos, C. G. and Breitner, J. C. S. (2004) 'The persistence of neuropsychiatric symptoms in dementia: the Cache County Study', *International Journal of Geriatric Psychiatry*, 19 (1).

Ulrich, R. S. (1984) 'View through a Window May Influence Recovery from Surgery', *Science*, 224 (4647).

Ulrich, R. S., Simons, R. F., Losito, B. D., Fiorito, E., Miles, M. A. and Zelson, M. (1991) 'Stress recovery during exposure to natural and urban environments', *Journal of Environmental Psychology*, 11 (3).

Uwajeh, P., Polay, M. and Onosahwo Iyendo, T. (2018) *Therapeutic Gardens – A healing environment for optimizing the health care experience of Alzheimer's and dementia patients: A narrative review*.

Whall, A. L., Black, M. E., Groh, C. J., Yankou, D. J., Kupferschmid, B. J. and Foster, N. L. (1997) 'The effect of natural environments upon agitation and aggression in late stage dementia patients', *American Journal of Alzheimer's Disease*, 12 (5).

Whear, R., Coon, J. T., Bethel, A., Abbott, R., Stein, K. and Garside, R. (2014) 'What Is the Impact of Using Outdoor Spaces Such as Gardens on the Physical and Mental Well-Being of Those With Dementia? A Systematic Review of Quantitative and Qualitative Evidence', *Journal of the American Medical Directors Association*, 15(10).

WHO (2015) *Health in 2015: from MDGs, Millennium Development Goals to SDGs, Sustainable Development Goals*.

Wood, S., Cummings, J. L., Hsu, M. A., Barclay, T., Wheatley, M. V., Yarema, K. T. and Schnelle, J. F. (2000) 'The use of the neuropsychiatric inventory in nursing home residents. Characterization and measurement', *The American journal of geriatric psychiatry: official journal of the American Association for Geriatric Psychiatry*, 8(1).

World_Bank (2018) *Poverty and Shared Prosperity 2018: Piecing Together the Poverty Puzzle [Elektronisk resurs]*. The World Bank Group.

Dementia care in the outdoors

- An environmental approach to epidemiological studies

CONCLUSION
The Swedish BPSD registry and environment assessments at dementia care homes might explain the role of the outdoor environment in dementia care.

Dementia & BPSD
Behavioural and Psychological Symptoms in Dementia (BPSD) affects 90% of all patients suffering from dementia. Today in Sweden, 150 000 people are diagnosed with the dementia, a number which is rising as life expectancy increases.

BPSD & outdoor assessments
According to Socialstyrelsen, people suffering from dementia should be offered *outdoor stay.* However, the scientific state of knowledge isn't declared.

Using Falkenberg as a sample, this study investigates if the Swedish BPSD registry and environment assessments can contribute to knowledge that may have larger impact on authorities in concern and further benefit the development of dementia care.

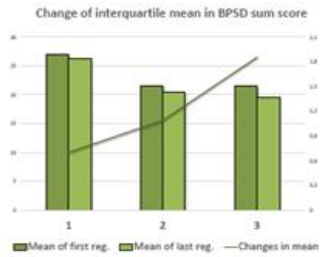

Fig 1. Improvements, i.e. positive change of interquartile mean, of BPSD from first to last registration (reg.) in BPSD registry. Including three groups; (1) patient without *outdoor stay*, (2) all patients and (3) patients with *outdoor stay*.

RESULTS
The results indicate that patients which have been offered outdoor stay develop fewer BPSD (fig. 1) compared with those who have not, although the BPSD registry data have uncertain validity and more research is required.

Environment assessments can distinguish care homes in accordance to evidence-based environmental qualities. Cross-analysing assessments outcome with BPSD registry data indicate increased percentage of BPSD improvement.

Future research
Future research need to examine the reliability and validity of the BPSD registry´s data to enable final conclusions in the matter.

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SCIENCE AND EDUCATION FOR SUSTAINABLE LIFE

6. Appendix

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Angående uttag av uppgifter i kvalitetsregister (BPSD-registret)

Undertecknad godkänner att Erik Nilsson får ut data från demensenhet* i Falkenbergs kommun. Med data avses avidentifierad statistik från BPSD-registret för aktuell enhet. Enhetens identitet kommer således vara känd för Erik Nilsson, däremot kommer datauppgifterna INTE vara möjliga att knyta samman med enskilda patienter på enheten. Uttagna data får endast användas till studentrelaterat projektarbete.

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