DEPARTMENT OF NEUROBIOLOGY, CARE SCIENCES AND SOCIETY

DIVISION OF OCCUPATIONAL THERAPY

Karolinska Institutet, Stockholm, Sweden

THE QUALITY OF THE PHYSICAL ENVIRONMENT AND ITS ASSOCIATION WITH ACTIVITIES AND WELL-BEING AMONG OLDER PEOPLE IN RESIDENTIAL CARE FACILITIES

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Stockholm 2016

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Published by Karolinska Institutet.
Printed by E-Print AB, 2016

ISBN 978-91-7676-404-6

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AKADEMISK AVHANDLING

som för avläggande av medicine doktorsexamen vid Karolinska Institutet offentligen försvaras i hörsal H3

Torsdagen den 8 december 2016 kl. 09.00

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This thesis is dedicated to the memory of my beloved mother Irene and my grandmother Ingrid, two strong women who inspired me in many ways. My mother Irene was a warm-hearted person who gave her unconditional love and encouragement to me and my sister. If she had had the opportunity, I am sure she would have engaged in higher education and become a doctor! Sadly, she passed away far too early in life. My grandmother was also a wonderful person who was always there for me. Her kitchen was the most pleasant and welcoming of places, where my sister, my cousin and I gathered when we were growing up, as it constituted the very heart of the house in which we all lived. Sometimes I wonder how Grandmother managed to do all the things she did. If she was not busy sewing or cooking, she was in the garden or on a ladder painting a wall!

Even though you are no longer alive, you both meant a lot to me and still do.

ABSTRACT

The physical environment can influence older people's health and well-being, and is often mentioned as being an important factor for person-centred care. Due to high levels of frail health, many older people spend a majority of their time within care facilities and depend on the physical environment for support in their daily life. However, the quality of the physical environment is rarely evaluated, and knowledge is sparse in terms of how well the environment meets the needs of older people. This is partly due to the lack of valid and reliable instruments that could provide important information on environmental quality.

Aim: The aim of this thesis was to study the quality of the physical environment in Swedish care facilities for older people, and how it relates to residents' activities and well-being.

Methods: The thesis comprises four papers where both qualitative and quantitative methods were used. Study I involved the translation and adaptation of the Sheffield Care Environment Assessment Matrix (SCEAM) into a Swedish version (S-SCEAM). Several methods were used including forward and backward translation, test of validity via expert consultation and reliability tests. In Study II, S-SCEAM was used to assess the quality of the environment, and descriptive data were collected from 20 purposively sampled residential care facilities (RCFs). Study III was a comparative case study conducted at two RCFs using observations, interviews and S-SCEAM to examine how the physical environment relates to older people's activities and interactions. In study IV, multilevel modeling was used to determine the association between the quality of the physical environment and the psychological and social well-being of older people living in RCFs. The data in the thesis were analysed using qualitative content analysis, and descriptive, bivariate and multilevel statistics.

Results: A specific result was the production of the Swedish version of SCEAM. The instrument contains 210 items structured into eight domains reflecting the needs of older people. When using S-SCEAM, the results showed a substantial variation in the quality of the physical environment between and within RCFs. In general, private apartments and dining areas had high quality, whereas overall building layout and outdoor areas had lower quality. Also, older people's safety was supported in the majority of facilities, whereas cognitive support and privacy had lower quality. Further, the results showed that environmental quality in terms of cognitive support was associated with residents' social well-being. Specific environmental features, such as building design and space size, were also noted, through observation, as influencing residents' activities, and several barriers were found that seemed to restrict residents' full use of the environment.

Conclusions: This thesis contributes to the growing evidence-based design field. The S-SCEAM can be used in future research on the association between the environment and people's health and well-being. The instrument could also serve as a guide in the planning and design process of new RCFs.

Keywords: activities, assessment, instrument, long-term care, multimethod, older people, physical environment, residential care facility, supportive environment, well-being

LIST OF SCIENTIFIC PAPERS

I. Nordin, S., Elf, M., McKee, K., Wijk, H. (2015). Assessing the physical environment of older people's residential care faciities: development of the Swedish version of the Sheffield Care Environment Assessment Matrix (S-SCEAM). BMC Geriatrics 2015; 15:3. Doi: 10.1186/1471-2318-15-3

II. Nordin, S., McKee, K., Wijk, H., Elf, M. (2016). Exploring environmental variation in residential care facilities for older people. Health Environments Research & Design Journal 2016. Doi: 10.1177/1937586716648703

III. Nordin, S., McKee, K., Wallinder, M., von Koch, L., Wijk, H., Elf, M. (2016). The physical environment, activity and interaction in residential care facilities for older people: a comparative case study. Scandinavian Journal of Caring Sciences, in press.

IV. Nordin, S., McKee, K., Wijk, H., Elf, M. (2016). The association between the physical environment and the well-being of older people in residential care facilities: a multilevel analysis. Submitted.

CONTENTS

LIST OF ABBREVIATIONS

BI	Barthel Index
DCM	Dementia Care Mapping
EBD	Evidence-based design
MMSE	Mini Mental State Examination
OERS	Observed Effect Rating Scale
PCQ	Person-Centred Care Questionnaire
PES	Pleasant Event Schedule
RCF	Residential care facility
SCEAM	The Sheffield Care Environment Assessment Matrix
S-SCEAM	The Swedish version of SCEAM
SPSS	Statistical Package for Social Sciences
WHO	World Health Organization
WHO-5	The 5-item World Health Organization Well-Being Index

PREFACE

In my work as a nurse in clinical practice within psychiatric care, I became both interested in the physical environment and aware of its influence on the people living and working in the environment. Although my research focuses on older people in residential care facilities (RCFs), there are many similarities with psychiatric settings. For example, many people stays there for a long time and depend fully on the support others provide in a setting that serves both as a home and as a workplace for care staff. The relocation to a care facility often involves a major life change for these people and might even be involuntary. As is the case with all human beings, they are individuals with different needs, desires and preferences and yet they are living in the same environment and are dependent on what it has to offer.

During my work on this thesis, I visited several care facilities and had the opportunity to talk to over 200 older people. Many of them shared their thoughts and life stories with me, and it became obvious that older people in long-term care are far from being a homogenous group, indeed some of those I became acquainted with made a strong impression on me. One woman had recently lost her husband of 80 years, and another person had just fallen in love at the age of 90. Some people had family and friends who came to visit them regularly, whereas others had no relatives left and their main interaction was with the care staff. Many of the people I met had several diseases or chronic health conditions, and lay in their beds or rested much of the day whereas others spent time outdoors on a daily basis and were able to exercise. In other words, long-term care involves people who have various abilities and interests, and the design of the physical environment clearly plays an important role in meeting those different needs and supporting older people with diverse levels of frailty.

1 INTRODUCTION

The present thesis focuses on the physical environment in residential care facilities (RCFs) for older people. The assumption at the beginning of this work was that the well-being, activities and interactions of older people can be affected by the environment. The interrelationship between people and their environments has for a long time been a central issue in nursing and the environment is a core concept. In RCFs, the quality of the physical environment is regarded as being of particular importance as it can compensate for decreasing abilities and can support many older people in their daily life.

An understanding of how the physical environment can affect people can support decisions about the design of care facilities for older people with frail health. However, there are few rigorous studies on the relationship between environmental aspects and the way these relate to the persons' daily life. Hence, early in the process of planning this thesis, there was a discussion on ways to obtain detailed information on environmental aspects and also on how to identify existing quality assessment instruments. Since there were no Swedish instruments available, the development of such an instrument was felt to be of great value. Accordingly, the work with this thesis involved the following steps: 1) the development of an instrument for the care context in Sweden including validation processes; 2) the exploration of the value of the instrument in Swedish care facilities for older people; 3) what this instrument can tell us with regard to the relationship between the physical environment and older people's activities and well-being.

1.1 Well-being and quality of life

In this thesis, the concept of well-being is central. Achieving a sense of well-being is important for everyone, even though a person's individual experience of well-being can be affected by internal and external factors (Maddox and Clark 1992). In gerontology, well-being is a frequently used outcome measure and can be described as subjective (Diener 1994) or psychological (Ryff and Keyes 1995). Psychological well-being is often discussed in terms of life satisfaction, happiness and meaning in life (Lawton 1983). Another concept is social well-being which refers to engagement in social activities such as social relations and interactions (Evans and Vallelly 2007).

It was important to cover different aspects of older people's well-being and therefore both their psychological and their social well-being were studied. For the purpose of this thesis, psychological well-being was defined as covering basic life perceptions of well-being, such as people's sense of cheerfulness, and calmness, and their interest in daily life events (Heun, Bonsignore, Barkow and Jessen 2001, Topp, Østergaard, Søndergaard and Bech 2015), while social well-being was defined as being people's engagement in pleasant activities such as being with family or friends, watching television or listening to music (Logsdon and Teri 1997, Meeks, Shah and Ramsey 2009).

Health and well-being are closely related, and according to WHO, health is not merely the absence of disease; rather health is about physical, psychological and social well-being (World Health Organization 1948). Well-being and quality of life are also related and sometimes used interchangeably, and there is no consensus on a single definition for either concept (Stanley and Cheek 2003). Quality of life has been defined as being a multi-dimensional concept that includes people's physical health, psychological well-being, social relations and physical environment (The World Health Organization Quality of Life Assessment (WHOQOL) Group 1998). Similar to the definition by WHO, Lawton suggested that a good life has several dimensions: psychological well-being (e.g. cognitive estimations of life satisfaction, emotions), objective environment (e.g. housing), behavioural competence (e.g. health, cognition, social behaviour) and perceived quality of life (subjective estimations of each quality of life domain). Quality of life embraces the overall experience of these dimensions (Lawton 1983, Lawton 1991).

1.2 Activities and interactions

This thesis considers the physical environment and its relation to activities and interactions of older people in RCFs. The engagement in activities for healthy ageing has gained emerging interest, and several studies have shown the benefits of activity in old age (Agahi 2008, Gabriel and Bowling 2004, Rowe and Kahn 1997).

Taking part in meaningful activities and social interactions is strongly related to a person's characteristics, identity and autonomy (Rowe and Kahn 1997, Rowe and Kahn 2015, Rowles and Bernard 2013). These aspects are crucial within person-centred care in which interacting with others is regarded to be of significant importance in sustaining identity and person-hood (Kitwood 1997). Several studies have demonstrated that social interaction is essential for the well-being of older people (Simone and Haas 2013, Park 2009), and leisure activities have been found to be associated with older people's life satisfaction (Agahi 2008). Activities such as listening to music, reading, writing and engaging in hobbies have also been shown to be positively associated with well-being (Menec 2003). McKee and colleagues (1999) found that older people living in RCFs who had good friends had higher activity levels compared to those without good friends, and friendship was influenced by care, resident choice and environmental aspects (McKee, Harrison and Lee 1999). Maintaining previous routines and habits can also be important for people in long-term care (James, Blomberg and Kihlgren 2014) as are the opportunities to make a choice in how to spend the day (Wadensten 2007). Moreover, social relationships and activities appear to influence older people's well-being as much as health (Wilhelmson, Andersson, Waern and Allebeck 2005, Farquhar 1995).

Associations between activities and well-being have been found even in very old age (Hillerås, Jorm, Herlitz and Winblad 1999). Moreover, research has shown that everyday activities are associated with the quality of life of people with dementia living in RCFs (Edvardsson, Petersson, Sjogren, Lindkvist and Sandman 2014). Residents with dementia expressed the importance of activities and valued the time spent walking outside, going to

shops and helping with domestic tasks at the RCF, whereas care staff focused on other activities such as exercise groups, art and craft activities (Popham and Orrell 2012). According to several recent studies, there might also be associations between life style factors including stimulating activities, and the cognitive ability of people with dementia (Kivipelto and Ngandu 2016, Winblad et al. 2016, Woods, Aguirre, Spector and Orrell 2012). Although these findings are promising, there is a need for more high quality research over a longer period of time (Woods et al. 2012).

Social isolation was found to be associated with higher mortality, re-hospitalization and serious diseases (Nicholson 2012), and limited social relationships constitute a severe threat to health and well-being among older people in RCFs (Winningham and Pike 2007). After moving into a RCF, older people are at risk of having a poor social life due to frail health (Havens, Hall, Sylvestre and Jivan 2004). The ability to stay in touch with loved ones might decrease, and it might also be difficult for older people to make new acquaintances due to cognitive impairments or hearing loss among fellow residents (Winningham and Pike 2007). However, as people age they might not have the same need for activities as they had previously in their life, and they can be more selective in their choices of activities and social interactions (Tornstam 2011).

According to recommendations in Swedish dementia care, people living in RCFs are entitled to individually tailored activities every day (National Board of Health and Welfare 2010). However, opportunities for social activity have been found to be poor (Edwards et al. 2003, National Board of Health and Welfare 2015b). Previous reports have demonstrated that the engagement in activities and social interactions is limited for people living in RCFs (den Ouden et al. 2015, Donovan, Stewart, McCloskey and Donovan 2014, Popham and Orrell 2012), and that residents with low mobility spend more time by themselves in their private apartments compared to those with higher mobility (Donovan et al. 2014). According to several reports, residents also spent limited time outdoors (National Board of Health and Welfare 2015b, Rodiek 2013). Although environmental factors alone cannot solve these issues, the present thesis derives from the idea that the quality of the physical environment in RCFs is assumed to be one important part in facilitating activities and interactions among residents.

1.3 The heterogeneity of older people

The older people involved in this thesis represent a highly heterogeneous group, diverse in terms of needs, desires and preferences. The process of ageing is commonly perceived as having a negative effect on people's well-being due to declining health (Musaiger and D'Souza 2009), and high chronological age can be regarded as a point in life when active contribution is no longer possible (World Health Organization, 2015). However, studies have shown that old age does not automatically mean poor well-being (Jivraj, Nazroo, Vanhoutte and Chandola 2014). Instead, growing old can be viewed as a period in life with more maturity and wisdom (Chinen 1984, Montgomery, Barber and McKee 2002), and with

opportunities to reflect upon previous life events and experiences (Butler 1974, Butler 2002). A meaningful life and healthy ageing can be achieved by adapting to life, and many older people feel strong and capable despite physical decline (Baltes and Mayer 2001).

Overall, the biological changes related to ageing involve a general deterioration of the organ systems due to a decline in cellular activity (Holliday 2004), but even though ageing is a continuous biological process affecting people's functioning and daily life, there are large differences in how people experience these changes and their effects (Lipsky and King 2015). Rather than focusing on chronological age, ageing is often described in terms of the third and fourth age (Laslett 1994). The third age is a period that usually occurs after retirement and that is characterized by good health, functional abilities, participation and activity. Accordingly, well-being is assumed to be good, and biological changes may have only a minimal impact on health and quality of life (Baltes and Smith 1999). The fourth age is described as a period of biological and functional decline but the transition to the fourth age occurs gradually and slowly, and is not strictly tied to a specific age range. However, the fourth age often begins at a late chronological age and is typically connected to increasing disabilities resulting in high needs of care (Baltes and Smith 2003). Importantly, the fourth age constitutes only a limited part of ageing (Laslett 1994).

1.4 Healthcare environments

Although the focus of this thesis is the physical environment, the healthcare environment also involves psychosocial aspects, namely how people perceive and experience the environment. These aspects brings to mind the care facility atmosphere in which the physical environment is a central part together with the psychosocial environment. For example, familiar features such as flowers, art or furniture can be valuable and give meaning to people being in the healthcare environment. Hence, factors in the physical environment conveys messages to the people in the facility, and the atmosphere can support their identity and their capacity to maintain interests and habits, and to be connected to the world outside the facility (Edvardsson 2005).

The importance of the healthcare environment for nursing has a long history with its roots in Florence Nightingale's environmental theory based on the idea that the environment can support a person's healing process. For example, environmental aspects such as ventilation, lighting and noise were regarded to be essential for supporting health and recovery of patients (Nightingale 1860). These ideas are still relevant and can be applied in todays' nursing (Medeiros, Enders and Lira 2015). Over the past decades, there has been an increasing interest in the creation of supportive healthcare environments in which the physical and psychosocial environments are closely interrelated and affect each other. For example, experiences of safe and welcoming environments and opportunities to maintain social relationships in the environment can contribute to supportive healthcare environments (Edvardsson, Sandman and Rasmussen 2005).

According to the nursing theory by Kim (2010), a healthcare environment will have special meaning to people physically, socially and symbolically. For example, the physical environment in a RCF may contain equipment not found in regular homes, and the social environment includes people others than those usually present in a home. The symbolic environment includes role expectations for the people in need of care together with values and ideas specific to the RCF (Kim 2010). Kim's theory was applied by Elo and colleagues (2011) in a study of well-being of older people. They found that healthcare environments that are safe and pleasant and enable social relations can support the well-being of older people together with symbolic aspects such as values and expectations (Elo, Saarnio and Isola 2011).

1.5 The physical environment and older people's well-being

In this thesis, the concept of the physical environment could be understood as being the architecture or the man-built environment. The description given by Harris and colleagues (2002) was employed whereby the environment is considered in terms of architectural, ambient and interior design aspects. Architectural aspects are relatively permanent, such as a building's spatial layout, room size or window placement. Examples of interior design are furnishings and colours, while ambient aspects refer to comfort in the environment, such as adequate lighting, temperature and noise levels (Harris, McBride, Ross and Curtis 2002).

The relation between the environment and people's health and well-being have been increasingly emphasised (Parker et al. 2004, World Health Organization Quality of Life (WHOQoL) Assessment Group 1998, Huisman, Morales, van Hoof and Kort 2012) and can be expected to have particular importance in long-term care since most residents spend a vast majority of their time within and around the facility (Rowles and Bernard 2013). Physical and cognitive disabilities can largely affect the daily life of many older people (Marengoni et al. 2011). Environmental factors contribute to social connection, activities and participation and support people with frail health (Barnes 2002, Joseph 2006, Joseph, Choi and Quan 2015). Studies within RCFs demonstrate that environmental aspects, such as light and sound levels and access to nature or outdoor areas, can improve older people's sleep and orientation and can increase involvement in activities and overall well-being (Brawley 2001, Joseph 2006). Proper flooring materials, safe handrails, adequate lighting and environmental cues can support mobility and orientation (Joseph et al. 2015), whereas monotonous environments were found to have a negative impact on residents with navigation difficulties and might lead to anxiety and confusion (Marquardt 2011, Marquardt, Bueter and Motzek 2014).

The design of the physical environment can also reduce psychiatric disturbance and increase well-being among those with dementia-related impairments (Cohen-Mansfield 2015, Day, Carreon and Stump 2000). Building design and cues in the environment such as colours and signage were found to affect how people with dementia found their way about (Cohen-Mansfield 2001, Marquardt 2011, Marquardt et al. 2014), and personalised cues such as nameplates, photographs and personal items were found to be especially supportive for this group. In addition, the camouflaging of environmental features such as doors and door knobs,

could reduce residents' attempts to leave the RCF, and this might improve their sense of well-being. Small-scale RCFs can also have a positive influence on people with dementia - that is to say, their functionality and well-being may improve as well as their ability to socialize (Marquardt et al. 2014).

In addition, the environment is of great importance for emotional connectedness in old age, and can influence whether older people feels 'at home' in their place of residence (Wiles 2005). For example, environmental aspects can help to keep the past alive, facilitate one's sense of identity and provide for privacy (Rubinstein and Parmelee 1992). Personal belongings and furniture can contribute to normalness in that they make unknown environments familiar to the person and might be essential for personal identity (Rowles and Bernard 2013, Rubinstein 1989). Following admission to a RCF, a residents' personal apartment can be of particular importance emotionally and offer a private space (van Hoof et al. 2016, Rijnaard et al. 2016). Older people with dementia living in RCFs perceived their private apartment to be a valuable place to be alone and do what they wanted (Popham and Orrell 2012).

1.6 The quality concept

Quality is a multifaceted concept and can be viewed from a variety of perspectives. The main focus in the present thesis is the quality of the physical environment in RCFs which is mainly understood as the capacity of the facility to support the older people's needs. According to the Oxford English Dictionary (1989) the concept is defined as a standard of something, as compared against other things of similar kind, and as a level of excellence. One of several definitions by the International Organization for Standardization, ISO, is that quality is the degree to which a set of inherent characteristics fulfills a set of requirements. This means that when those characteristics meet the requirements, high quality is achieved, whereas characteristics that do not meet all requirements will result in low quality (Hoyle 2001). A suggested definition of care quality is "the degree to which health services of individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge" (Lohr and Schroeder 1990, p 707).

The design of the physical environment is one essential factor for quality in care (Henriksen 2007, Mourshed and Zhao 2012), although little is known about what constitutes good design. Within building planning and construction, the concept of design quality is commonly used, but there has been no clear definition (Elf, Engström and Wijk 2012). Design quality can be discussed in terms of "wicked problems" involving the difficulties in solving a problem due to contradictory and changing requirements (Rittel and Webber 1973). Moreover, the design quality concept has been under criticism as it has mainly been considered from an architectural perspective and has not involved the users of the building (Cuff 1989). However, the views of users are increasingly emphasised in research on high quality buildings in general as well as within healthcare buildings (Salonen et al. 2013, Nimlyat and Kandar 2015).

Since the design quality concept will affect decisions on how to best design physical environments, it is essential to define the concept. In a recent review, Anåker and colleagues (2016) explored the concept in relation to healthcare facilities (Anåker, Heylighen, Nordin and Elf 2016). The concept was shown to cover different aspects of the environment such as ecological values, resilience of engineering and building construction. Societal and cultural values were also viewed as quality indicators emphasizing the importance of meeting the needs of the users (i.e. patients, relatives and care staff).

1.7 Evidence-based design

Closely related to design quality is the concept of evidence-based design (EBD) which has been introduced to ensure high-quality physical environments. It is the process of basing planning and decisions regarding buildings on the best available knowledge from research and practice to inform design (Hamilton and Watkins 2009). It has increasingly been used in healthcare facilities with the goal to achieve the best possible patient and staff outcomes such as well-being (Stankos and Schwarz 2007, Ulrich et al. 2008, Joseph 2006). Inherent in EBD is an interdisciplinary approach which requires an integration of evidence from various disciplines (Kasali and Nersessian 2015) and multiple perspectives including representatives from the branches of architecture, building construction and healthcare (Elf, Frost, Lindahl and Wijk 2015b). A central part of EBD is to begin by defining the needs of the user of a facility (i.e. older people) in relation to evidence from research and practice (Hamilton and Watkins 2009).

When the care facility is completed and in use, it is essential to evaluate the results (Zimmerman and Martin 2001). This is known as post-occupancy evaluation (POE) which is an established quality indicator (Baird 2001, Henriksen 2007). It is based on the idea that the consideration of the users' experiences can generate new knowledge to be used when planning and designing future care facilities (Zimmerman and Martin 2001). However, the evaluation cannot depend solely on the users' opinions and experiences of the environment as these tend to be subjective in nature, and it is important to also consider predetermined environmental quality indicators and assessment methods for objective evaluations (Baird 2001). Thus, there is a need to use valid assessment instruments that are based on evidence on what is known to influence health and well-being among the building users (i.e. older people).

1.8 Environmental quality assessments

Given the importance of the physical environment in RCFs, instruments that can assess environmental quality are required. Using psychometrically sound instruments is crucial for the research quality and the main quality criteria are validity and reliability (Kimberlin and Winterstein 2008, Polit and Beck 2012). However, validations occur in a variety of settings and populations and occur over time, and literature reviews on assessment approaches and instruments are therefore valuable when selecting an instrument (Kimberlin and Winterstein 2008). Therefore, the work with this thesis started with a literature review (Elf, Nordin, Wijk

and McKee 2015c) to identify relevant instruments available in English, with the potential for cultural adaptation to the Swedish context. According to the results, valid and reliable instruments based on the needs of the people using the facilities were lacking.

A majority of the instruments were old and did not always cover aspects that had been shown to be important for older people, and many of the instruments were developed for American care settings, which differ from those in Europe. However, some of the most established instruments are worth mentioning since they have been a template for the development of other instruments. For example, one of the earliest instruments is the Multiphasic Environmental Assessment Procedure (MEAP) developed in the United States as early as 1984 (Lemke and Moos 1986, Moos and Lemke 1984). It is a comprehensive and detailed instrument consisting of several sub-scales that can be applied in large care facilities, and that requires an assessor who is familiar with environmental design. A similar instrument is the Professional Environment Assessment Protocol (PEAP) which was developed for dementia-specific care facilities (Lawton et al. 2000). PEAP covers several domains representing high-quality environmental outcomes such as promoting safety, supporting opportunities for privacy, and facilitating social contacts.

1.9 The Sheffield Care Environment Assessment Matrix

The literature review resulted in the identification of an instrument that was determined to have the greatest potential for use in Swedish RCFs. The Sheffield Care Environment Assessment Matrix (SCEAM) (Parker et al. 2004) was developed in the United Kingdom, a country with an approach to long-term care provision for older people that is not greatly dissimilar to that found in Sweden. However, the most important criteria for choosing SCEAM were that it had a strong theoretical and user-oriented foundation, that it manifests a person-centred approach by assessing environmental quality in terms of how well a facility supported the needs of its residents, and that it had been validated to a reasonable degree (Elf et al. 2015c).

SCEAM embodies the philosophy that a good RCF can enhance the well-being of the older people and support them even as frailty increases. It was developed from an exhaustive review of research on RCFs for older people, through an analysis of building standards and guidelines, and through consultation with stakeholders and user groups from different fields such as architecture, building construction, and the care of older people. Additionally, established instruments such as the previously mentioned MEAP and the PEAP served as basis for the development of SCEAM (Parker et al. 2004, Torrington 2007).

SCEAM covers several domains such as Normalness, Privacy, Choice and Control, Physical Support, and Cognitive Support, and thus representing the needs of the older people that have been theorized to be important for those living in a RCF (Parker et al. 2004). For example, the Physical Support domain contains environmental features that are regarded as facilitating the everyday life of those with physical disabilities, while features in the Choice domain

contribute to people's opportunities to use the facility in accordance with their personal wishes and preferences. Another example refers to Normalness and contains features assumed to contribute to people's sense of homeliness as well as to reduce the institutional character of a facility. Further, SCEAM consists of nearly 400 items classified into these domains, and structured into building locations such as Lounges, Dining Areas or Gardens. The structure of SCEAM is shown in Figure 1.

DOMAINS	**ARCHITECTURAL ELEMENTS**									
	External/ Entrance	Lounge	Dining room	Bathroom	WC	Personal rooms	Overall layout	Staff	Garden	Plans items
Privacy										
Personalisation										
Choice and control										
Community										
Safety and health										
Physical support										
Comfort										
Cognitive support										
Awareness of outside world										
Normalness and authenticity										
Provision for staff										

Figure 1. Structure of the Sheffield Environment Assessment Matrix (SCEAM)

1.10 Theoretical and conceptual frameworks

A theory on person – environment interactions served as the theoretical framework in the present thesis. Broadly, it is based on the assumption that the environment influences the person, and that the person influences the environment. The previously described domains in SCEAM also constituted an important basis in this thesis as these domains are theorized to cover a range of needs assumed to be crucial for older people with frail health, and for which

the physical environment should compensate. The theoretical and conceptual approaches that were used in this thesis are described in the following paragraphs.

1.10.1 Interaction between the person and the environment

Overall, the four studies within this thesis have been guided by Lawton and Nahemow's general ecological model of ageing (1973) in which the interaction between the person and the environment is central. The person is defined as having a set of competencies such as physical and cognitive health, also referred to as functional abilities (Scheidt, Norris-Baker and Wahl 2003). The environment is defined in terms of demands or pressure. When there is a fit between the person's competencies and the demands from the environment, this can result in positive outcomes. Accordingly, a mismatch can result in negative outcomes. According to the model, behaviour is a function of both the person and the environment, and by looking at a person´s competence in relation to the demands from the environment, a person's behaviour can be predicted (Lawton and Simon 1967, Lawton and Nahemow 1973).

However, this model has been criticized due to its deterministic perspective that does not take into account personal resources, or how the environment can be used to meet person's needs (Gitlin 2003, Golant 2003). In the work with this thesis, the environment has been regarded as having the potential to support the needs of the older people as frailty increases. Thus, another part of Lawton's work was applied - the environmental docility hypothesis. According to this hypothesis, people with lower functional capabilities are more sensitive to the environment than those with higher capabilities. In other words, the influence of the environment increases as the functional ability of the older person decreases (Lawton and Simon 1967, Lawton and Nahemow 1973).

1.10.2 Person-centredness

Person-centred care is regarded as an important factor in the work towards high-quality care in several contexts within healthcare, not least in long-term care facilities for older people (McCormack 2004, Koren 2010). It is said to be associated with care satisfaction and improved health and well-being (Epstein, Fiscella, Lesser and Stange 2010, Mead and Bower 2002, Oates, Weston and Jordan 2000, Sjogren, Lindkvist, Sandman, Zingmark and Edvardsson 2013). According to a person-centred approach, care should be holistic and should consider aspects other than those purely related to functional abilities, such as a person's resources and preferences. It is about seeing the person behind the disease, viewing the situation from the person´s perspective, making efforts to establish good relations, and adapting the environment so that it meets the person's needs and enhances her/his well-being (Edvardsson, Winblad and Sandman 2008b, McCormack and McCance 2010).

Despite the emerging focus on person-centred care approaches, relatively little attention have been paid to the physical environment which is one of its central parts. There is however an emerging interest in the importance of environmental aspects for supporting the needs of the person (McCormack, Karlsson, Dewing and Lerdal 2010). Importantly, the environment has

a great potential to facilitate or hinder person-centred care processes, and must be considered as an integral part of person-centred care (McCormack and McCance 2006). For example, non-institutional and familiar features such as art, flowers and nice views from a window can have a positive impact on people's perception of the care being provided (Edvardsson, Sandman and Rasmussen 2008a). The building layout can also influence person-centred care, and this can be exemplified by the traditional large hospitals or institutions where norms and rules have served the organization rather than the needs of the person (McCormack 2004).

Person-centred care is about establishing routines into daily practice beginning with the person's narrative. The narrative contains the person's own views on her or his state of health and its impacts on everyday life, and involves sharing decisions about health and care. Through documenting on the person's preferences, values and care decisions, more emphasis is placed on the person's perspective. Moreover, it contributes to transparency in care and facilitates continuity (Ekman et al. 2011, Wilberforce et al. 2016). The physical environment can be regarded as a prerequisite for establishing these routines as building layout and symbols inform people about what can be expected in the environment and whose decisions are being prioritized. For example, long corridors without furniture in RCFs for older people might send a message that this is not a place for social interactions (Edvardsson 2005).

Person-centred care has been operationalized in assessment instruments in several care contexts including residential care for older people (Wilberforce et al. 2016). One example is the Person-Centred Climate Questionnaire (PCQ) which was developed as a means of recording people's experiences with the care environment (Edvardsson, Sandman and Rasmussen 2008a, Edvardsson, Koch and Nay 2009). Aspects related to a climate of safety and everydayness are regarded to be important for person-centred care together with hospitality. For instance, a clean environment can be a symbol for safe care, while a non-institutional and home-like environment can promote a sense of everydayness (Edvardsson, Sandman and Rasmussen 2008a). In the present thesis, this instrument was chosen to gain information on residents' perceptions on care quality.

1.11 Care of older people

Throughout the present thesis, the concept RCF is used and defined as being special housing for older people that offers health-care services delivered by professional care staff 24 hours a day. In addition, when referring to older people living in RCFs, the concept resident is used (National Board of Health and Welfare 2011). There are many different concepts when it comes to care facilities for older people. Internationally, the term 'assisted living facility' is often used to describe the same type of care environment as that referred to as 'residential care facility' since it implies a model of housing, support services and care for older people with high levels of care needs. The core values in assisted living are similar to those within Swedish RCFs: they emphasise dignity, independence, choice and accessibility (National Board of Health and Welfare 2012b).

1.11.1 Residential care facilities for older people in Sweden

Since the work with this thesis is restricted to Swedish RCFs, these are described in the following paragraphs. Of the Swedish population, 20 percent are over 65 in age, and this number is expected to rise (National Board of Health and Welfare 2016b). The care of older people is an important part of Swedish welfare policy regulated by law (HSL, SFS 1982:763, SOL, SFS 2001:453). Modern aged care was introduced in the 1950s when municipalities introduced home-care services, and there was a development of housing for older people. During this period many large facilities were built. Those with very frail health were admitted to nursing and convalescent homes or to hospitals (Åman 1976).

In 1992, the care of older people underwent a major change when a new reform was introduced, the so-called "Ädelreformen" (National Board of Health and Welfare 1996). The responsibility for older people was transferred from the county councils to the municipalities, and this system remains in force. The municipalities were given comprehensive responsibility for services to and care of people with special needs in both regular and special housing. This responsibility also involved the provision of a sufficient number of RCFs for older people. A central goal was to achieve a homelike care environment and increase living standards for older people. As a result of the reform, several types of housing for older people came to be included under the same term: 'residential care facilities'. The reform also resulted in an adjustment to building legislation, with RCFs having the same requirements as regular housing. Thus, there has been increased focus on accessible and usable facilities for older people with frail health, and these aspects have been further strengthened in terms of recently developed quality standards (Swedish Standards Institute 2015). The care system is required to meet high standards, and the main goal is to ensure older people retain their independence and have a say in their everyday life. The objective for Swedish aged care policy is for older people to grow old in a safe and secure environment and to be treated with respect (SOL, SFS 2001:453, Swedish Standards Institute 2015). Moreover, meaningful activities and social interactions with others are important care elements (National Board of Health and Welfare 2010).

1.11.2 The organization of Swedish residential care

Approximately 88 000 older people live in RCFs in Sweden, of which 80 percent are 80 years or older (National Board of Health and Welfare 2016a). RCFs are managed by local authorities, and a place in a facility is offered after a decision has been made based on the person's needs. The municipalities are the main providers, while the private sector accounts for about one fifth even though municipalities maintain overall responsibility. In general, care, service and standards in Swedish RCFs are high (National Board of Health and Welfare 2016a) with care staff available around the clock to support residents with daily tasks and provide them with nursing care. Rehabilitation and physical training are offered by occupational therapists and physiotherapists connected to the RCFs, whereas physicians can provide medical care via the public health system. Organized activities and entertainment are often offered. Care includes laundry services, cleaning and meals. Swedish RCFs provide

private apartments for their residents that often comprise a kitchenette, a bathroom with shower and space for personal possessions.

1.11.3 Current trends in residential care

Many RCFs in Sweden have been renovated or dismantled, and large discrepancies have been found to exist between different RCFs and municipalities regarding environmental standards (National Board of Health and Welfare 2015a, National Board of Health and Welfare 2011). Over the last decade, there has been a decrease in the number of available places for residents in RCFs, which has resulted in it being more difficult to receive a formal assistance decision. The result is that fewer older people are being offered a place at a RCF and that current RCF residents have substantially higher care needs compared to ten years ago. One third of Swedish municipalities will be unable to provide care services for older people within five years (National Board of Health and Welfare 2016b). This trend applies to several countries where inadequate capacity has been identified regarding access to long-term care settings (World Health Organization 2015). Another issue is that clinical efficacy and safety aspects have guided the planning and design of many RCFs and sometimes overruled the ambition of creating home-like facilities, and instead contributed to an institutional character and impersonal impression (Andersson 2011, Swedish Standards Institute 2015).

1.12 Rationale for the thesis

It is well recognised that the physical environment has an important influence on health and well-being and that it plays a central role in the daily life of people in general. It is reasonable to assume that environmental aspects of long-term care facilities are particularly important for the well-being of older residents given that they spend the great majority of their time within the care facility due to frail health. Previous studies have shown that supportive physical environments can enhance the health and well-being of people, whereas inadequate living environments can have a severe impact on people with frail health, resulting in rapid acceleration in health decline, reduced independence and reduced well-being. The physical environment is an integral part of person-centred care as it is a foundation for those opportunities for activities and social interactions that are so important for a person's well-being. At present, there is limited knowledge on environmental quality in residential care facilities and consequently poor understanding of how the environment affects older people living in these facilities. Once occupied, care facilities are rarely evaluated, and there is a lack of feedback to building planners and architects on how different environmental aspects work in practice. One reason for this knowledge gap might be the lack of valid and reliable instruments for assessing the quality of the physical environment in care facilities for older people. Until now, such instruments have been mostly absent for use in a Swedish care context. The extent to which a care facility meets the needs of its residents is of huge importance, and it is critical that an evidence-base is developed on how the physical environment can support the well-being of older people with frail health.

2 RESEARCH AIMS

The aim of this thesis was to gain knowledge regarding the quality of the physical environment in Swedish care facilities for older people, and how it relates to residents' activities and well-being. Such knowledge can contribute to a more comprehensive picture of the person-environment relationship.

The specific research aims of each study were:

- To translate, adapt and further develop the Sheffield Care Environment Assessment Matrix (SCEAM) to make it suitable for use in Sweden (Study I)

- To describe variation in environmental quality in Swedish RCFs using the S-SCEAM (Study II)

- To explore older people's activities in RCFs in the context of the quality of the physical environment by examining how the environment influences these activities (Study III)

- To determine the associations between the quality of the physical environment and psychological and social well-being of older people living in RCFs (Study IV)

3 MATERIALS AND METHODS

3.1 Study design

This thesis is built upon four studies. Researching the relationship between the physical environment of long-term care facilities and the activities and well-being of residents is a complex and multifaceted task, and requires the use of more than one method (Teddlie and Yu 2007). To achieve the aim of the thesis, a cross-sectional and multi-method design was applied including quantitative and qualitative approaches. Interview-administered questionnaires, structured and unstructured observations, and informal interviews were used. An overview of the studies is presented in Table 1.

Table 1. Overview of Studies I-IV

	Study I	Study II	Study III	Study IV
Design	Cross-sectional, Mixed method design	Cross-sectional design, Quantitative	Case study, Mixed method design	Cross-sectional design, Quantitative
Settings and participants	Expert group consultation; (14 + 6 experts)	20 RCFs	2 RCFs; 54 residents, 25 care staff, 4 relatives	20 RCFs; 200 residents
Data collection methods	Structured Questionnaire, Interviews, Written comments	Structured observational assessments	Structured observational assessments Walk-along interviews	Structured observational assessments Questionnaires (resident interview, proxy, medical records)
Instruments	SCEAM	S-SCEAM	S-SCEAM, DCM, OERS	S-SCEAM, WHO-5, PES-AD, MMSE-SR, PCQ-P, BI
Methods of analysis	Consensus estimation, Percent agreement, Qualitative content analysis	Descriptive statistics, Bivariate statistics	Descriptive statistics, Qualitative content analysis	Descriptive statistics, Bivariate statistics, Multivariable statistics– multi-level modelling
Timeline	Study I, Jan 2011-Dec 2012	Study II and Study IV, Jan 2013 – June 2014. Study III, Spring 2014		

Sheffield Care Environment Assessment Matrix (**SCEAM**); Swedish version of the Shef field Care Environment Assessment Matrix (**S-SCEAM**); Dementia Care Mapping (**DCM**); Observed Emotion Rating Scale (**OERS**); World Health Organisation-5 Well-being Index (**WHO-5)**; Pleasant Events Schedule AD (**PES-AD**); Mini Mental State Examination -Swedish revision (**MMSE-SR**); Person-Centred Climate Questionnaire – Patient version (**PCQ-P**); Barthel Index (**BI**)

3.2 Settings and participants

The study sample consisted of 20 RCFs, see Table 2. The final sample of participants contained individuals in expert groups (Study I), residents (Studies III-IV), relatives and care staff members (Study III). In Study II there were no participants involved as this study was focused on physical environment assessments in RCFs. Settings and participants are further described under their respective headings below.

With regard to the sample size requirement for the thesis, this needs to be considered with reference to the multi-level nature of the sample. The sample of residents live within RCFs, so as such the data collected from individual residents is 'nested' within the care facilities. Such nested data causes problems during analysis, because a consequence of nested data is that the scores on any particular measure/instrument of those individuals within a given 'nest' will tend to correlate more than will the scores of individuals from different 'nests'. Standard analytic techniques do not take account of this nesting effect, and so in the thesis a multilevel analytic approach was adopted. From a multi-level perspective, there were effectively two samples in the thesis – the sample of RCFs (level 2 units), and the sample of residents from within the RCFs (level 1 units). While there are no absolute rules governing the sample size requirements for multilevel modelling, statistical power is influenced mostly by the number of level 2 units sampled. It is widely held that the number of Level 2 units should ideally be 30 or greater, and should not be less than 10 (Hox, Moerbeek and van de Schoot 2010). Pragmatic restraints for the thesis meant that the objective for the level 2 sample was N= 20 RCFs. From each RCF, 10 residents was the recruitment target, giving N=200 for the main resident sample in Study IV.

3.2.1 Settings

The main inclusion criterion for RCFs was that the facility provided care for older people 24 hours a day. Dementia specific care facilities were excluded as they tend to differ with regard to environmental design, care organization and staffing. A sampling frame was developed that sought to maximize variation among recruited RCFs when it came to a number of key characteristics. The frame used a national classification of municipalities determined by population, commuting, industry, tourism and economic structure (Swedish Association of Local Authorities and Regions 2010), to enable the purposive selection of a number of contrasting municipalities. From each selected municipality, the executive director for social support and care of older people was contacted, given information about the study and requested to provide a list of eligible RCFs in the municipality. From the list of RCFs provided, the respective facility managers were contacted and provided with information about the study, before being asked if they were interested in having their facility included in the study. Facilities were purposively approached in order to obtain a final sample of RCFs located in both densely and sparsely populated regions and with variation regarding building design, year of construction, and size and type of ownership. Of 27 facility managers approached, seven declined participation due to, for example, a heavy workload or an

ongoing research projects. In addition, another RCF was included for the reliability tests in Study I, and this RCF was selected as it contained several units with different layout.

Table 2. Characteristics of residential care facilities (RCFs) (N=20)

Size	Small	Medium small	Medium large	Large
Number of beds at each RCF	< 32	33-42	43-52	53-68
Number of RCFs	3	8	4	5
Type of ownership (n)				
Municipality (**15**)	3	6	3	3
Private (**3**)	0	2	0	1
Foundation (**2**)	0	0	1	1
Year home built (n)				
Pre 1960 (**5**)	1	1	2	1
1960-1991 (**9**)	1	5	1	2
1992-2013 (**6**)	1	2	1	2
Geographic location (n)				
Cities (**4**)	0	0	2	2
Urban municipalities (**9**)	1	4	2	2
Semi-rural municipalities (**3**)	1	2	0	0
Rural municipalities (**4**)	1	2	0	1

3.2.2 Participants

The participants in each study (Study I, Study III and Study IV) and the way they were recruited are described below.

Study I consisted of instrument development and the translation work involved a bilingual professional translator who was consulted for backward translation of the instrument. The translator was recruited via professional contacts. For instrument adaptation, a group of experts was consulted (N=14). These were recruited through purposive sampling of individuals representing construction planning (N=3), architecture (N=4), geriatric care (N=5), and senior citizen's members (N=2). Another group of experts (N=6) were consulted to investigate the internal structure of the instrument. These individuals were also purposively

selected due to their knowledge and competence representing construction planning and geriatric care, and were identified via the network of the research group.

In Study III, the total number of participants were: 54 residents, four relatives and 25 care staff members (N=83). The care home managers of the two included RCFs (RCF A and RCF B) were asked to distribute information letters to all residents, relatives and care staff. The information letter contained information on study purpose and procedures, and stated that participation was voluntary. All residents were invited to participate, and informed consent was obtained from residents or their relative after they had indicated that they wished to participate in the study. All of the residents who were willing to participate in RCF A were included (N=26). An equal number of residents from the two RCFs were included in the structured observations. A majority of the residents included in the structured observations also participate in the unstructured observations and walk-along interviews. In addition, the care staff and relatives who were at the RCF during the time for data collection were invited to participate in unstructured observations and walk-along interviews.

In Study IV, 200 residents were included with 10 residents from each RCF (N=200). The inclusion criteria were that residents should be able to express themselves verbally in Swedish and should be able to hear. As for Study III, the care home managers were asked to distribute information letters to residents, relatives and care staff with information on study purpose, procedures, and the fact that participation was voluntary. The residents were invited to participate, and informed consent was obtained from residents or their relative when they had indicated that they were willing to participate in the study.

3.2.3 Characteristics of residents

In Study III, the mean age of residents included in the unstructured observations was 87.5 years. There were minor differences between the residents living at the two RCFs (RCF A and RCF B) included in this study. In RCF A, the residents were estimated to have higher communication and socialization abilities, whereas residents in RCF B had higher abilities regarding orientation and mobility. In Study IV, the resident mean age was 87.35 years, and the mean length of stay was two years. Many of the residents had several diseases and chronic conditions such as cognitive impairments (e.g. dementia or dementia-related impairment), muscular-skeletal conditions (e.g. arthritis, osteoporosis), mental conditions (e.g. depression, psychosis), cardio-vascular diseases (e.g. stroke), respiratory diseases (e.g. asthma), and functional losses (e.g. visual impairment, hearing decline).

3.3 Data collection methods

The process of translating and adapting SCEAM for a Swedish caring context started in January 2011 and was completed in December 2012 (Study I) (Table 1). The data collection from the 20 RCFs was conducted over one and a half years starting in January 2013 with nearly one-week visits at each RCF (Study II and Study IV). The data collection for the case study was carried out over five weeks in 2014 (Study III).

Since the focus was the evaluation of the physical environment in RCFs, a main part of the data collection comprised environmental assessments using the newly translated and adapted instrument, S-SCEAM, mainly described in the result section. Prior to data collection, the use of the instrument was practiced together with one of the developers of the original instrument, and pilot assessments were conducted at several RCFs that were not included in the study sample.

Data on the quality of the physical environment were collected using S-SCEAM via walk-through observations both inside and outside the RCFs. These observations were supplemented by information from the care home managers at each RCF, e.g. information on local traffic or distance to service facilities. Digital photos were taken in communal indoor and outdoor areas as support for memory (Studies II-IV). The structured observations of resident activities and interactions were conducted during weekdays from 07.00 to 21.00. The goal was to capture a residents' average day, and the observations took place over several days (Study III).

In Study IV, data on residents' psychological well-being, their perceived care quality, and their cognition were collected from in-person interviews. The residents were free to choose a place for the interview, and these were often held in the residents' private apartments. Visual aids in the form of cue cards were used during the interviews to facilitate and support the person when she or he was responding to the questionnaires (Berkman and D'Ambruoso 2006), and the response options were written in large and clear text or figures. Demographic data and data on residents' health status, including independence, were obtained from the care home managers (via medical records) and from resident interviews. To reduce the risk of exposing the resident for too many questionnaires, data on social well-being were collected from the contact person of each resident (proxy instrument). In Study III, data on residents' functional status and demographics were retrieved from the contact person.

3.3.1 Instrument translation and adaptation

Instrument translation and adaptation comprised several stages (Study I). The original SCEAM with its 370 items was translated from English to Swedish by the author of this thesis (SN). Translated items were discussed and reviewed in the research group before they were translated back to English by a professional translator. The back-translated version was compared with the original version and discussed before equivalence was achieved. The next stage involved content validation via expert consultation (N=14), and both quantitative and qualitative data were collected. The experts received an information letter describing the instrument and its theoretical foundation, and details on the task. They were requested to judge the instrument's relevance by scoring each item on a four-point scale (1=not relevant; 2=somewhat relevant; 3=quite relevant; 4=highly relevant) or by using a scoring option: do not understand the item.

A content validity index (CVI) was calculated for each item (I-CVI), and for the whole instrument (S-CVI). I-CVI was calculated as the proportion of experts assessing each item as quite relevant or highly relevant. S-CVI was computed by adding the average I-CVI values and dividing them by the number of items. According to literature (Polit and Beck 2006) a minimum value of 0.78 was considered to be acceptable for I-CVI, while a value of 0.90 was required for S-CVI. The experts were also encouraged to comment on the entire instrument as well as on individual items, and to suggest new items. Interviews were conducted with 6 members from the expert group to learn more about their thoughts and reflections on the instrument. These interviews were transcribed verbatim. All qualitative material (written comments and interviews) was read and reviewed, and meaning units were identified and condensed before they were structured into categories (Patton 1990). Both quantitative and qualitative data were used in the adaptation of the instrument, and items with low CVI values were discussed in the research group and supported by qualitative data. After revision, the content validity was examined again by a sub-group of 3 of the original group experts. The instrument was further revised before reliability tests were performed in 6 ward units within a RCF. Test-retest reliability was determined by assessments carried out two weeks apart, and inter-rater reliability was determined via data collected by SN and another researcher separately assessing the same units on the same day at different times. Inter-rater reliability tests were repeated after two weeks. Cohen's kappa (κ) and consensus estimation were used to assess stability and equivalence (Stemler 2004).

A final stage involved further validation of the revised version of S-SCEAM through an examination of the internal structure of the Swedish version. Experts (N=6) were requested to allocate each item to one of the domains, and were also asked to give their written comments. Fleiss' kappa was calculated and the results were discussed in the research group together with comments. Minor adjustments were made before the creation of a final version.

The structure of S-SCEAM is similar to the previously described original SCEAM, and covers the following domains: Cognitive Support; Physical Support; Safety; Normalness; Openness and Integration; Privacy; Comfort, and Choice. Domains are shown in Figure 2. S-SCEAM contains 210 items, and each item describes an environmental feature that relates to one of the following location categories: External/Entrance; Lounge; Dining Area; Private Apartment; Overall Building Layout; and Garden. Each item is scored as present (1) or absent (0). The scores can be aggregated per domain (e.g. Safety), or per location (e.g. Dining Area) or as an overall building score. All aggregated scores are standardised to range between 0 and 100, and higher scores mean higher quality of the physical environment. In addition, the domain scores can be aggregated into formal and domestic locations within the RCF. The formal locations are: Overall Building Layout; Entrance/External Area, and Garden. The domestic locations are: Lounge; Dining Area, and Private Apartment.

As the instrument development was part of the result in this thesis, the Swedish version is further described in the result section.

Figure 2. S-SCEAM domains

3.3.2 Assessments of resident well-being

Psychological well-being was assessed with the Swedish version of the Well-Being Index (WHO-5). The scores range from worst possible to best possible by scoring on a 6-point scale ranging from 0=*At no time* to 5=*All of the time*. High scores indicate higher well-being. It has been translated into many languages and has shown excellent validity across various countries (Bech, Olsen, Kjoller and Rasmussen 2003, Heun, Bonsignore, Barkow and Jessen 2001, Topp et al. 2015) including Sweden (Löve, Andersson, Moore and Hensing 2014).

Social well-being was assessed using an adjusted version of the Pleasant Events Schedule-AD (PES-AD) (Logsdon and Teri 1997). The PES-AD is a proxy instrument where the residents' contact person answers the questions. It contains 20 items about common activities in RCFs such as listening to music, watching television, having dinner with friends or family and going on outings. The activities are estimated whether they are pleasant or not, and the frequency of performing the activity. The scores range from 0 to 2 with higher scores indicating higher well-being. The original instrument has shown itself to have good validity

and reliability (Logsdon and Teri 1997), but there is no Swedish version available. Thus, the instrument was translated into Swedish and pilot-tested by the author of this thesis. The pilot-tests were conducted at several occasions in a RCF not included in the study sample. The translation and pilot-testing was discussed within the research group throughout the process.

3.3.3 Resident demographics and functional status

In Study IV, data on residents' age, gender, main diagnosis, health conditions and level of independence were retrieved from the manager of the RCF from medical records and by interviewing the resident. The Barthel Index (BI) (Mahoney 1965) was used to receive information on independence in daily life activities of residents. The BI consists of ten areas capturing activities of daily living such as feeding, bathing and grooming. The scores range from 0 to 100, with high scores indicating independence. For cognitive functioning, the Swedish version of the Mini Mental State Examination MMSE-SR (Folstein, Folstein and McHugh 1975) was used. The MMSE-SR includes 20 items with scores ranging from 0 to 30, and higher scores indicate better cognitive functioning. It consists of the following areas: orientation, registration, attention and calculation, recall, language and copying.

3.3.4 Assessments of resident activity and emotional state

In Study III, resident activities, interactions and locations were collected through an adapted version of Dementia Care Mapping (DCM) (McKee et al. 1999), and signs of the emotional state of residents were assessed using The Observed Emotion Rating Scale (OERS) (Lawton, Van Haitsma and Klapper 1996). The original DCM is an instrument widely used in dementia care (Brooker 2005, Cooke and Chaudhury 2013, Sloane et al. 2007). The adapted version emphasises activities and can be used to observe people with or without dementia, and has been validated against measures of well-being and quality of life of older people (McKee et al. 1999). The adapted version maps observed activity into nine behavioural category codes (BCC): 1) active social interaction, 2) passive social interaction, 3) involved in recreation, 4) being socially inactive, 5) receiving care, 6) eating or drinking, 7) communicating with no response, 8) walking or wandering, 9) unavailable for observation. The BCC 1, 2 and 3 involve information on who the resident is interacting with (i.e. care staff or other resident). The location of the residents' activities was also coded. If more than one behaviour could be observed, the more social or engaged behaviour was coded (Sloane et al. 2007). To explore residents' emotional state during activities, the OERS was combined with DCM. The affective states were coded into one of the following categories: signs of pleasure, signs of anger, signs of anxiety, neutral, signs of depression, signs of interest, or signs of content. Individual DCM and OERS data were collected and described as the proportion of time the resident spent within each activity, location and affect.

3.3.5 Assessing residents' perceived quality of care

In Study IV, the Person-Centred Climate Questionnaire – patient version (PCQ-P) (Edvardsson et al. 2008a) was used to assess the extent to which the climate of RCF is perceived by residents to be person-centred. It contains 17 items, and the scoring ranges from

1=*No, I disagree completely* to 6=*Yes, I agree completely*. Higher scores indicate higher levels of person-centredness. The instrument encompasses three sub-scales: everydayness, safety, and hospitality, which are all regarded to be important for a person's well-being. The PCQ-P has shown to be a reliable and valid instrument, with Cronbach alpha 0.64 for hospitality, 0.82 for everydayness and 0.93 for safety (Edvardsson et al. 2008a, Edvardsson et al. 2009).

3.3.6 Field notes and interviews

In Study III, unstructured observations were conducted to explore the interrelations between the physical environment and the residents. These observations included residents, staff and relatives, and were often followed by informal interviews in connection with the ongoing activity. Field notes were written during the observational session, and after completion of each session, more extensive notes were made to describe the environmental aspects and the observed situations, events or activities as completely as possible. The use of walk-along interviews allowed for a more comprehensive understanding of what was going on, and more knowledge could be obtained on how different aspects in the physical environment were perceived by residents, staff and relatives (Evans and Jones 2011, Jones, Bunce, Evans, Gibbs and Hein 2008).

3.4 Methods of analysis

Studies I and III had mixed method designs including quantitative and qualitative data analysis. In Studies II and IV quantitative data were analysed. The Statistical Package for the Social Sciences (SPSS) for Windows were used for statistical analysis in the quantitative studies. The analytical procedures involved in this thesis are described below.

3.4.1 Statistical analysis

3.4.1.1 Descriptive statistics

Descriptive statistics were used to describe the characteristics and environmental quality of the RCFs that were included (Studies II-IV) as well as to describe resident characteristics and outcomes (Study IV). Means, standard deviation and frequencies were used for S-SCEAM scores (Study II-IV), DCM and OERS scores (Study III) together with WHO-5, PES-AD, BI and MMSE-SR scores (Study IV). In Study III, the DCM scores were obtained for each resident and aggregated to show the proportion of the observed time the resident spent in each behaviour category, in interaction, and in different locations. The OERS scores were produced in the same way (Study III).

3.4.1.2 Bivariate statistics

Bivariate statistics were used to examine the associations between variables (Studies II and IV). The Pearson product-moment correlation coefficient (Pearson's *r*) was used to assess associations between S-SCEAM location and domain scores, and between S-SCEAM scores and RCF characteristics (e.g. quality of overall building layout and the age of the building) (Study II). Pearson's *r* was also used to assess the associations between resident variables

such as well-being and perceived care quality, and S-SCEAM domain scores and resident variables (e.g. Choice and cognitive functioning) (Study IV). Statistical significance for bivariate analysis was set at p <.05 (Studies II and IV).

3.4.1.3 Multivariable statistics

In Study IV, an analysis was performed using multilevel modelling (MLM) to examine the associations between environmental quality of the RCFs and resident variables. The reason for using MLM was the hierarchical structure of the data: individual residents were nested within RCFs. Residents who share the same environment tend to have more in common with each other than they do with people in different environments, and MLM takes these aspects into account. Thus, this study used a two-level model (level 1=resident; level 2=RCFs) to examine the influence of the physical environment on residents' well-being. Bivariate analyses determined the S-SCEAM (level 2) variable whose associations with the resident (level 1) variables of interest (psychological and social well-being) were consistently strong, and this S-SCEAM variable was selected for use in the multilevel model. The model was tested in several steps. Firstly, an unconditional model was tested and secondly, predictors were added to the model. Statistical significance for bivariate analysis was set at p <.05. Significance level was set at p<.10 for multi-level analysis (Study IV).

3.4.2 Qualitative content analysis

Qualitative data were analysed by using content analysis (Studies I and III) to transform the data into findings (Patton 1990). In Study I, the analysis covered interviews and written comments from experts with regard to the relevance of the S-SCEAM instrument. In Study III, the analysis involved field notes from observations and written texts from the walk-along interviews. The qualitative content analysis in both studies was broadly performed using the following steps:

1) The content was read and reviewed several times to gain a sense of the whole and to become immersed in the text material
2) Meaning units were identified
3) The meaning units were condensed
4) The condensed meaning units were structured into cateogories

Although the qualitative content analysis is described in these steps, the process was iterative with repeated movement back and forth in the material.

3.5 Ethical considerations

Conducting research in facilities housing people with frail health and reduced capacities requires specific consideration, and although such studies are urgently needed, it is important to put a strong emphasis on ethical awareness. The present thesis was conducted in accordance with the Helsinki Declaration (World Medical Association 2013) and ethical guidelines for nursing research (Nurses'Federation 2003). The ethical principles of autonomy, beneficence, non-maleficence and justice have guided the work. The thesis was

approved by the Regional Ethical Review Board for Research in Uppsala, Sweden (Ref No. 2011/323).

Entering a RCF means being a guest in the homes and daily lives of other people. It also means coming into a place that serves as the workplace for care staff and where care activities are ongoing. Moreover, older people living in RCFs are a heterogeneous group covering a wide range of personalities and a variety of abilities as well as functional disabilities and frailties. Consequently, research in such facilities requires substantial adjustments for the older person, the care staff and the researcher, and an adequate amount of time is a prerequisite for this kind of study.

To reflect the population of older people living at RCFs today, the goal was to include people with different levels of frailty. It is well known that many residents suffer from both cognitive and physical impairments, but frailty is not a reason for excluding them from research. As with other groups in society, older people also have the right to be involved in research and have their specific conditions highlighted. To gain more knowledge on the person-environment relationship, it was regarded as necessary to include older people with frail health in the present thesis. Some older people might have limited autonomy, a factor that needs to be considered. However, it is important to be aware of the fact that these conditions can vary over time. This became obvious during this thesis, and on some occasions the resident interview was divided over several days. Despite high levels of frail health among those people included, the overall impression was that they perceived the meetings to be positive, and a majority shared their thoughts and expressed gratitude. This is in accordance with previous studies showing that older people appreciate being given the opportunity to reflect and share with others their experiences of the phenomenon being studied (Boström 2014).

Before informed consent from the residents was obtained, they received written and verbal information on the study purpose and on what participation would entail. They were also informed about confidentiality and their right to withdraw from the study at any time. This information was repeated verbally in conjunction with each data collection session. Significant others were also provided with information (Studies III-IV). Observations of the physical environment were a main part of the data collection, and these observations were supplemented by digital photos (Studies II-IV). In Study III observations also included residents, relatives and care staff. As observations were conducted in communal areas, it was not possible to give oral information to all individuals that were not directly included in the study. Thus, information sheets were placed in different locations within the RCFs a few weeks before the beginning of the data collection period. The information was repeated verbally to participants prior to each data collection session. All participants (residents, relatives and care staff) gave their informed consent to participate in the study, and when appropriate so did significant others.

Nevertheless, several ethical difficulties were present in the current thesis related to the risk of violating the residents' privacy. Conducting observations can result in an infringement on residents' privacy, and taking photographs can also have a negative impact. Thus, the researcher strived to be particularly responsive and attentive in order to avoid such risks, and tried to detect any signs of discomfort or anxiousness. No observations were conducted in situations regarded as being offensive or uncomfortable for the residents, and photographs were only taken in common spaces. No older people or staff were photographed. The environmental assessments were conducted in all spaces around the facility, and the residents' private apartments were accessed after approval from the resident in question.

Another risk was that residents might feel incompetent during the interview. For example, the MMSE-SR includes several questions that might make the person aware of decreasing abilities, which can be a painful experience. However, the researcher strived to make the older person feel comfortable and safe, and did not pressure the person in any way. In some cases, significant others were present during interviews with older people with cognitive disabilities. A common reason for this was, as the significant others explained, that they wanted to support the older person and make her or him feel secure and comfortable during the interview.

4 RESULTS

Overall, this thesis has resulted in more knowledge on the quality of the physical environment in RCFs and how it relates to older people living in these facilities. A specific result of the research thesis was the production of a valid and reliable instrument which enables detailed quality assessments of RCFs, and opens up the possibility of examining the relationship between detailed aspects of the environment and residents' activities and interactions, and well-being. In the following section the findings from the four studies included in the thesis will be presented: A Swedish environmental quality assessment instrument; Facility characteristics and environmental quality; Resident activities in relation to environmental factors, and Resident well-being in relation to environmental factors.

4.1 A Swedish environmental quality assessment instrument

The first part of this thesis involved the translation and adaptation of SCEAM (Study I). This process resulted in major changes with items being removed, revised or relocated, and with new items being added. Initially, forward and backward translation resulted in minor adjustments before the creation of a first Swedish version reviewed by experts. According to the CVI, one third of the items were found to be of low relevance although few items were rated as having very low relevance. Written comments and interview data from the experts supported the quantitative CVI results, and their overall opinion was that the instrument was too comprehensive and time-consuming to use. The results revealed differences between British and Swedish building standards and care culture. For example, some items had a positive meaning in the UK but did not in Sweden, as exemplified below:

- Are there padded backrests on the WCs?
- Are private apartments carpeted?

In addition to cultural differences between the two countries, the results showed that the original version had potential for improvements. For example, the instrument contained features that were not directly linked to the environment, such as items on work practice or items regarding the maintenance of the building. Further, the experts pointed out that some of the items were difficult both to understand and to respond to due to unclear concepts or that they included several sub-queries. The experts also suggested new items with regard to the use of new technology or other issues that were not reflected in the original version and pointed out the need for adjusting the instrument to current care practice for older people. For example, one of the experts raised the following issue that resulted in a new item:

"Can couples live together, or is everyone single?" (Informant 3, Architect)

The translation and adaptation of the instrument resulted in a Swedish version with good validity and reliability. The content validation of the revised version indicated I-CVI scores above 0.78, and S-CVI scores above 0.90, the criteria for excellent content validity. Test-retest reliability showed high stability (96% for rater 1; 95% for rater 2) with good kappa

values (Cohen's κ = 0.903 and 0.869). Inter-rater reliability also showed high levels of agreement on two different occasions (95% and 94%) with high kappa values (Cohen's κ = 0.851 and 0.832) (Polit and Beck 2006) (Study I). Further validation in terms of inter-rater agreement for items within domains via expert consultation showed substantial overall agreement. Fleiss' kappa was 0.63 ranging between 0.43 and 0.75 (Study II). The items and domains were discussed in the research group and further revisions resulted in a final version consisting of 210 items and 8 domains. The domains are described in Figure 3.

Domain	Description
Cognitive Support Items (N=18)	The features in this domain contribute to a facility that has visual clarity and/or simplicity, with a logical layout and reference points, promoting an independent everyday life for residents with cognitive or sensory disabilities, or with impaired orientation. Some features enable residents who are in common or personal areas to better observe events and activities.
Physical Support Items (N=44)	The features in this domain facilitate an independent everyday life in the home for persons with physical disabilities such as impaired mobility or impaired strength, grip or dexterity. The features aid accessibility for all persons regardless of their level of functioning, and some provide space for those residents who need assistance or use technical aids.
Safety Items (N=38)	The features in this domain contribute to risk reduction in the facility and a residents' sense of security, for example reducing or preventing the risk of falls, contamination or accidents within or near the facility. Some features afford clear lines of sight to users of the facility to promote awareness of problems should they arise.
Normalness Items (N=21)	The features in this domain contribute to residents' perception of homeliness in the facility, promoting a sense of familiarity or enabling the use of personal belongings, and reducing the facility's institutional character. The features include equipment, spaces, or elements that one might find in a typical home.
Openness and Integration Items (N=19)	The features in this domain enable participation in and awareness of community life. The features give a welcoming aspect to the facility, provide access to community services, visitors or other persons from outside the home, or support community functions within the facility. Some features allow residents to observe or experience the world outside the facility, including aspects of everyday life in the surroundings.
Privacy Items (N=16)	The features within this domain support residents in going about their everyday activities free from intrusion or observation by staff, other residents, visitors to the facility, or passers-by in the surroundings. Some features create opportunities for solitude or withdrawal into personal spaces, or allow residents to be undisturbed even in social areas such as lounges, dining rooms and gardens.
Comfort Items (N=29)	The features in this domain contribute to a pleasant, stimulating and sustainable facility, promoting good sound, light, and air conditions that still vary from room to room. The features include: varied and natural materials to provide sensory stimulation; energy-efficient operations; and weather- and/or climate protected areas outside the facility.
Choice Items (N=25)	The features within this domain contribute to residents' use of the facility based on their own preferences, providing for alternative spaces and rooms in which to spend time, and which also support different kinds of social interaction and activity. The features promote the residents' independent use of the facility, allowing them to change or control aspects of the indoor environment, or access external areas.

Figure 3. S-SCEAM resident need domains' description

4.2 Facility characteristics and environmental quality

As would be anticipated given the sampling strategy adopted, there was substantial variation on a number of characteristics in our sample of RCFs (Study II), see Table 2. The most recently built facility was one year old, and the oldest facility was built 117 years ago. A majority of RCFs were owned by the municipality, three were private and two were foundations. Nearly half of the facilities were geographically located in urban municipalities. The smallest RCF had 23 residents, while the largest housed 68 residents. The number of care units within each facility ranged from two to seven, while the number of floors ranged from one to seven. All RCFs but one had lounges, and 16 had gardens, whereas only five of the RCFs offered communal bathrooms.

4.2.1 Variations regarding the quality of the physical environment

There was substantial variation in the environmental quality of the 20 RCFs, both between facilities and within facilities when considering different locations and resident need domains. The RCF with the highest overall standardised score for location had 83.73 and the RCF with the lowest score had 54.94. The largest differences between different RCFs with regard to specific locations were found for gardens with RCF No 18 scoring 44.44 and RCF No 13 scoring 94.44. There were also variations within RCFs. For example, RCF No 8 had scores near 100.00 for Dining Areas and below 60.00 for Overall Building Layout. Regarding resident need domains, the largest discrepancies were found between Safety and Cognitive Support. In general, the RCFs had high scores for Safety with an overall score above 80.35, whereas the Cognitive Support had an overall score of 60.05 with a majority of RCFs demonstrating scores below 60.00. There were also discrepancies between domestic locations (lounge, dining area, and private apartments) and formal locations (overall layout, entrance and external area, and garden). In general, the domestic locations had higher mean scores across RCFs compared to formal locations showing lower scores. Large variations were found between domestic and formal locations within RCFs. For example, Normalness in RCF No 4 scored 92.16 for domestic locations and 40.00 for formal locations.

There were also similarities across the RCFs. In general, the residents' private apartments had high scores followed by dining areas whereas overall building layout and garden had lower scores. Considering resident need domains, most RCFs demonstrated high scores on the Safety and Comfort domains, whereas the scores on Cognitive Support and Privacy were consistently lower.

Table 3. Standardised S-SCEAM scores by domain and location (N=20)

RCF	Location	Safety	Comfort	Openness & Integration	Physical Support	Normalness	Choice	Privacy	Cognitive Support	Overall score
1	all areas	93.33	84.62	79.29	87.17	71.67	77.50	63.23	86.67	80.43
	formal	86.67	69.23	80.00	77.27	60.00	75.00	85.71	100.00	79.24
	domestic	100.00	100.00	78.57	97.06	83.33	80.00	40.74	73.33	81.63
2	all areas	78.73	70.00	78.57	73.68	87.50	63.89	80.00	79.81	76.52
	formal	69.23	44.44	57.14	68.42	75.00	50.00	60.00	75.00	62.40
	domestic	88.24	95.56	100.00	78.95	100.00	77.78	100.00	84.62	90.64
3	all areas	79.76	80.91	86.67	89.34	74.23	72.61	64.29	60.77	76.07
	formal	66.67	69.23	73.33	86.36	60.00	68.75	57.14	61.54	67.88
	domestic	92.86	92.59	100.00	92.31	88.46	76.47	71.43	60.00	84.26
4	all areas	77.44	71.52	60.71	71.72	81.15	86.83	88.28	57.50	74.39
	formal	61.54	66.67	71.43	63.16	75.00	83.33	80.00	41.67	67.85
	domestic	93.33	76.36	50.00	80.28	87.30	90.32	96.55	73.33	80.94
5	all areas	76.81	86.61	80.00	76.14	72.86	87.50	61.36	52.80	74.26
	formal	60.00	76.92	60.00	59.09	60.00	75.00	50.00	69.23	63.78
	domestic	93.62	96.30	100.00	93.18	85.71	100.00	72.73	36.36	84.74
6	all areas	88.28	78.29	60.00	80.81	65.65	78.68	64.66	71.28	73.46
	formal	80.00	76.92	40.00	72.73	40.00	75.00	50.00	69.23	62.99
	domestic	96.55	79.66	80.00	88.89	91.30	82.35	79.31	73.33	83.93
7	all areas	85.95	90.79	74.24	63.94	68.24	77.98	60.39	58.04	72.45
	formal	78.57	84.62	66.67	54.55	60.00	75.00	57.14	61.54	67.26
	domestic	93.33	96.97	81.82	73.33	76.47	80.95	63.64	54.55	77.63
8	all areas	88.13	83.33	80.00	73.64	64.05	67.71	44.76	71.47	71.64
	formal	86.67	69.23	60.00	77.27	40.00	68.75	42.86	84.62	66.17
	domestic	89.58	97.44	100.00	70.00	88.10	66.67	46.67	58.33	77.10
9	all areas	65.55	76.84	80.00	80.30	66.08	76.97	78.57	43.91	71.03
	formal	42.86	69.23	60.00	77.27	40.00	68.75	57.14	46.15	57.68
	domestic	88.24	84.44	100.00	83.33	92.16	85.19	100.00	41.67	84.38
10	all areas	75.56	68.65	68.48	67.47	94.12	73.36	70.13	50.35	71.02
	formal	66.67	61.54	73.33	72.73	100.00	56.25	85.71	46.15	70.30
	domestic	84.44	75.76	63.64	62.22	88.24	90.48	54.55	54.55	71.73
11	all areas	91.11	82.52	67.58	71.82	74.12	56.85	56.06	67.13	70.90
	formal	86.67	92.31	53.33	63.64	60.00	37.50	66.67	61.54	65.21
	domestic	95.56	72.73	81.82	80.00	88.24	76.19	45.45	72.73	76.59
12	all areas	74.12	72.12	72.86	81.65	72.86	82.52	46.22	63.46	70.73
	formal	60.00	69.23	60.00	81.82	60.00	68.75	57.14	76.92	66.73
	domestic	88.24	75.00	85.71	81.48	85.71	96.30	35.29	50.00	74.72
13	all areas	80.95	79.35	67.50	74.29	67.62	71.88	63.33	59.62	70.57
	formal	78.57	69.23	60.00	68.18	40.00	68.75	66.67	69.23	65.08
	domestic	83.33	89.47	75.00	80.39	95.24	75.00	60.00	50.00	76.05

14	all areas	77.98	75.64	76.67	68.45	95.24	68.75	53.33	44.23	70.04
	formal	64.29	76.92	53.33	54.55	100.00	62.50	66.67	38.46	64.59
	domestic	91.67	74.36	100.00	82.35	90.48	75.00	40.00	50.00	75.48
15	all areas	73.57	88.46	70.00	70.06	87.97	51.04	41.13	73.59	69.48
	formal	57.14	76.92	40.00	45.45	80.00	43.75	50.00	53.85	55.89
	domestic	90.00	100.00	100.00	94.67	95.95	58.33	32.26	93.33	83.07
16	all areas	83.73	72.12	75.64	71.13	65.00	68.29	59.65	46.15	67.71
	formal	73.33	69.23	66.67	54.55	60.00	62.50	66.67	53.85	63.35
	domestic	94.12	75.00	84.62	87.72	70.00	74.07	52.63	38.46	72.08
17	all areas	80.21	68.49	80.00	66.82	65.94	57.07	47.62	70.77	67.11
	formal	66.67	69.23	60.00	63.64	60.00	56.25	28.57	61.54	58.24
	domestic	93.75	67.74	100.00	70.00	71.88	57.89	66.67	80.00	75.99
18	all areas	74.72	53.03	78.57	74.21	84.56	64.88	62.73	43.56	67.03
	formal	58.33	33.33	57.14	68.42	75.00	58.33	80.00	41.67	59.03
	domestic	91.11	72.73	100.00	80.00	94.12	71.43	45.45	45.45	75.04
19	all areas	84.50	76.03	82.14	71.21	45.83	68.45	50.00	54.17	66.50
	formal	75.00	77.78	64.29	68.42	25.00	75.00	60.00	75.00	65.06
	domestic	94.00	74.29	100.00	74.00	66.67	61.90	40.00	33.33	68.02
20	all areas	76.67	74.01	68.79	65.20	67.06	68.60	56.06	45.80	65.27
	formal	66.67	69.23	46.67	68.18	40.00	56.25	66.67	46.15	57.48
	domestic	86.67	78.79	90.91	62.22	94.12	80.95	45.45	45.45	73.07
Over - all score	all areas	80.35	76.67	74.39	73.95	73.59	71.07	60.59	60.05	71.33
	formal	69.28	69.57	60.17	67.28	60.50	64.27	61.74	61.67	64.31
	domestic	91.43	83.76	88.60	80.62	86.67	77.86	59.44	58.44	78.35

4.2.2 Associations between facility characteristics and environmental quality

Few associations were found between care facility characteristics and environmental quality. Larger RCFs in terms of the number of residents and the number of staff had lower quality regarding Entrance and External areas, and a greater number of floors were associated with lower Overall Building Layout quality. Older RCFs had lower quality regarding formal locations (Overall Layout, Entrance/External area, and Garden) (Studies II and IV).

4.3 Resident activities in relation to environmental factors

When two RCFs (A; newly renovated facility, and B; non-renovated facility) with regard to resident activity and interactions were compared, similarities were found. In both RCFs, the residents spent more than half the day alone in their private apartments, and they also spent a large proportion of their time in the dining area. Most of the time, the residents spent sleeping or dozing, or were engaged in self-care, while the second most common activity was active social interaction with others, verbally or otherwise. There were also different patterns between the resident activities in the RCFs. The residents in the renovated RCF were observed in recreational activities, such as media engagement, around 20 percent of the day compared to those living in the non-renovated RCF who spent 10 percent of their time in

these activities. By contrast, the residents in the non-renovated RCF were more often passively interacting in activities such as sitting in the lounges observing people or care staff passing by.

4.3.1 The influence of environmental factors on residents' activities

Several factors in the physical environment were found to influence residents' activities and interactions (Study III), see Figure 4. Design aspects such as open-plan solutions with automatic door opening and access to elevators in communal spaces were found to facilitate the ability of residents to move around inside and outside the care facility, while closed doors seemed to limit the opportunity for residents to move around freely and use different spaces by themselves. Large windows facilitated access to daylight and gave residents opportunities to observe and follow daily-life events outdoors. The location of the building was also found to influence activities. Steep slopes and noise from traffic seemed to restrict outdoor activity, whereas the placement in a residential area with smooth ground facilitated the residents' contact with outdoor life as exemplified below:

"He appreciates the benefits of taking a walk around the building at any time of the day using his walker and explained the importance of daily exercise and fresh air" (walk-along interview with a resident in RCF B).

Space was also found to be important, and larger private apartments seemed to facilitate residents' activities and social interactions, while small apartments had an adverse effect on residents' activities. The larger apartments in the newly renovated RCF provided space for the residents to move around within the apartment and also offered opportunities for them to have with them their private furniture and personal items.

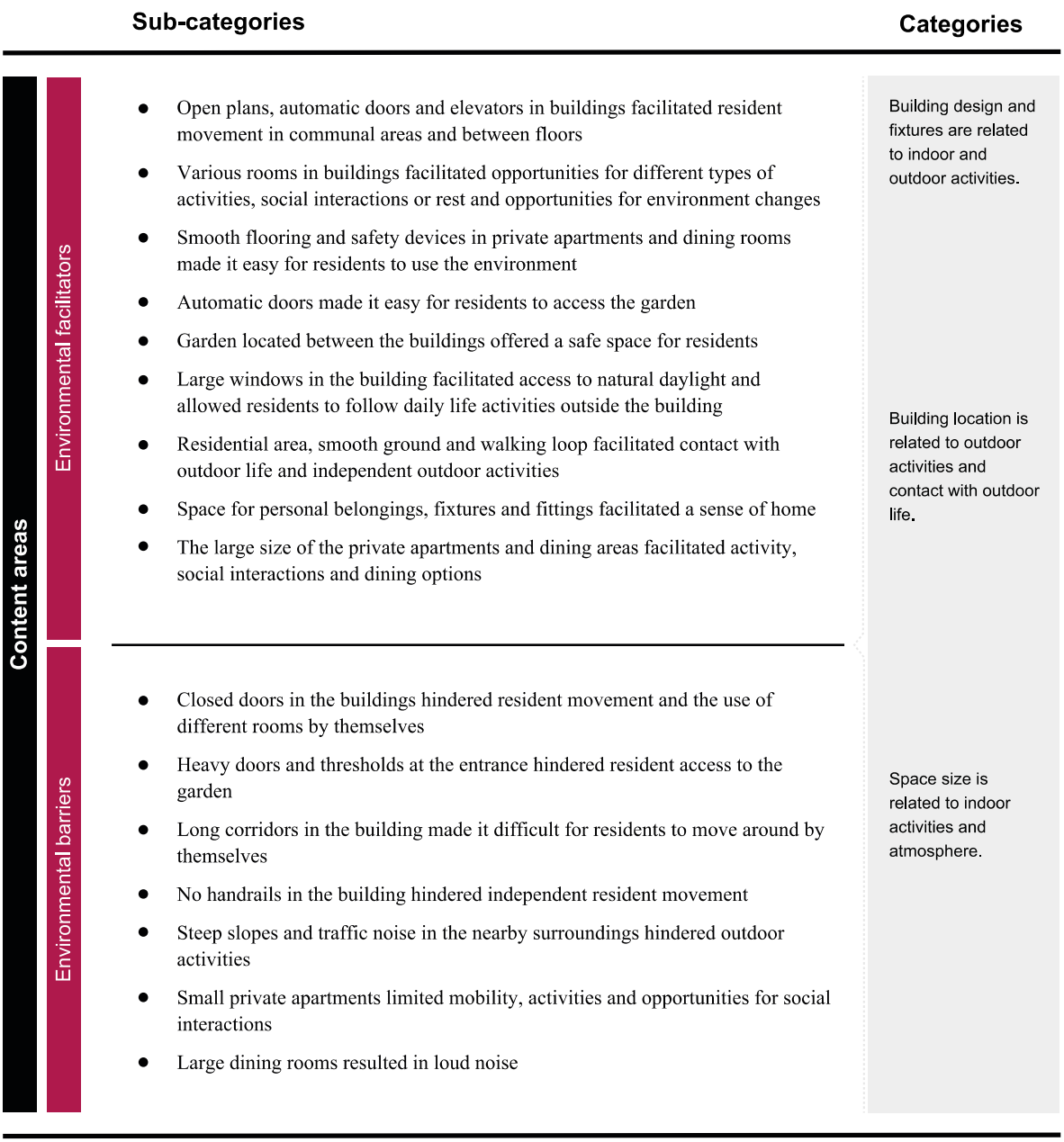

Figure 4. Content areas, sub-categories and categories

4.4 Resident well-being in relation to environmental factors

4.4.1 Bivariate associations

As shown in Study IV, several associations were found among resident variables such as social well-being and perceived care quality regarding safety. Significant associations were found between cognitive functioning and social well-being and independence. Some resident characteristics were also associated with environmental factors. For example, psychological well-being was associated with number of floors in the RCF. In addition, associations were found between the S-SCEAM domain Normalness and residents' perceived care quality in terms of everydayness.

4.4.2 Multilevel analysis

The quality of the physical environment was found to be associated with the well-being of older people. Prior to investigating the associations between environmental quality and resident well-being in a multilevel analysis, bivariate correlations were computed between S-SCEAM domain scores and resident well-being. The results showed that the Cognitive Support domain had the most consistent and strong associations with psychological and social well-being (r=-.391 and .375 respectively, see Study IV). This domain was therefore selected as the home level (Level 2) variable for use in multilevel analysis to further examine the associations between environmental quality and resident well-being.

Table 4 presents the results of the multilevel model of social well-being. The analysis was conducted in several steps. The first column shows the results from the unconditional model (no predictors), which indicated that 10.8% of the variance in residents' social well-being was due to home-level factors. In the second step, resident independence was entered into the model with a reduction in residual variance in social well-being at both individual level and home-level. Thirdly, resident perceived care quality was entered into the model resulting in a further reduction in residual variance at both levels. Finally, Cognitive Support was added to the model producing a reduction of 25% in residual home-level variance. The multilevel model was therefore significantly improved at each step demonstrating that, after controlling for the effects of resident independence and perceived care quality, environmental quality as assessed by the S-SCEAM, Cognitive Support domain was associated with residents' social well-being. A second multilevel model found that only a small proportion of the variance in residents' psychological well-being could be attributed to home-level factors, and so this analysis was abandoned.

Table 4: Multilevel model of social well-being [1] (N=20)

Model Step and Variable entered	-2LL, df	Change in-2LL, df	*P*	Level 1 variance	Level 2 variance
1 Baseline	47.095, 1	--	--	.0685	.0083
2 Independence [2]	20.332, 2	26.763, 1	p<.001	.0596	.0079
3 Care-quality (Safety and Everydayness) [3]	8.563, 4	11.769, 2	p=.001	.0564	.0068
4 Cognitive Support [4]	5.488, 5	3.075, 1	p=.048	.0564	.0051

Note: 1, PES-AD; 2, BI; 3, PCQ-P; 4, S-SCEAM

5 DISCUSSION

The aim of this thesis was to gain knowledge regarding the quality of the physical environment in Swedish care facilities for older people, and how it relates to residents' activities and well-being. Within the framework of this thesis, a valid and reliable instrument assessing the quality of the physical environment was produced for a Swedish caring context (S-SCEAM) (Nordin, Elf, McKee and Wijk 2015), and the development of this instrument was an important prerequisite for the following studies. By means of this new instrument, information on environmental quality could be obtained, revealing substantial variation in quality between and within the facilities (Nordin, McKee, Wijk and Elf 2016a). A main finding was that the quality of the physical environment was associated with the social well-being of residents (Nordin, McKee, Wijk and Elf 2016b). Another important finding showed that environmental factors influenced resident activity, and despite high environmental quality in general, several barriers seemed to limit their full use of the facility (Nordin et al. 2016c).

5.1.1 Links between environmental quality and resident well-being

The findings demonstrated that the physical environment in terms of Cognitive Support was associated with residents' social well-being - i.e. if the environment was not supportive for older people with frail cognitive health, it influenced their wellbeing. This is in line with other studies showing that building design is associated with resident behavior and functionality (Cohen-Mansfield 2001, Marquardt 2011, Marquardt et al. 2014), and people who have difficulties in finding their way around and orienting themselves are particularly vulnerable to facilities with poor environmental design (Joseph 2006, Marquardt 2011). For example, monotonous physical environments can have negative effect on older people and cause confusion and anxiety (Joseph 2006).

By using the S-SCEAM, it was possible to identify the specific aspects of the environment that are essential for people with fragile health, such as logical structure which is easy to interpret and which has clear reference points and cues. An environment that makes it possible for people to observe the events and activities taking place is another example. The assessments of residents' social well-being involved social activities and interactions such as going on outings, reading or listening to stories, having coffee with friends, and helping out at the facility. Therefore, what is apparent is that a cognitive supportive physical environment can enhance residents' social well-being in terms of these kinds of activities and interactions.

It is interesting that in general terms, Cognitive Support scored lowest of the S-SCEAM domains in the sample of RCFs (Table 3) which is in accordance with previous research in similar settings (Popham and Orrell 2012). A common view during the S-SCEAM assessments was long corridors, often with similar flooring and wall colours, and without cues or reference points (see Figure 5). For people with cognitive impairments, this can result in negative effects such as confusions (Marquardt et al. 2014). These findings are alarming since most people living in RCFs have high levels of frail health, including dementia-related

conditions (Schram et al. 2008, Seitz, Purandare and Conn 2010). Thus, it is of outmost importance that focus is on cognitive supportive environments that at the same time promote resident safety and independence. Plausible explanations for RCFs that are poorly designed might be a lack of knowledge regarding how to design cognitive supportive environments. Another explanation might be that building standards have focused on the safety and physical needs of older people (e.g. the provision of adequate handrails), whereas cognitive needs have been given less consideration. Moreover, in a recent review, the concept of design quality was shown to be strongly related to technical and engineering aspects (Anåker et al. 2016) and this has also been the common trend in developed instruments used for assessing the quality of the physical environment (Elf et al. 2015c). Thus, the reason for Cognitive Support being of relatively low quality might reflect values that still rule the design of care facilities for older people, and that aspects related to cognition have yet to be implemented in the design. The fact that S-SCEAM captures cognitive aspects in the physical environment might result in an increased awareness of the potential for a care facility to support, through design, residents with cognitive frailties.

Figure 5. Photo: Susanna Nordin

However, it is important to bear in mind that it takes a long time to introduce new ways of thinking and to bringing evidence into the design process. Over past years, there has been an increasing interest in the importance of cognitive aspects in RCFs. For example, current national guidelines and building regulations (Swedish Standards Institute 2015, Svensson 2015) together with research emphasise design features that support older people with cognitive frailties (Bradshaw, Playford and Riazi 2012, Fleming, Fay and Robinson 2012). This stresses the importance of considering design aspects early in the planning and design process (Elf, Eldh, Malmqvist, Öhrn and von Koch 2015a, Day et al. 2000). In addition, post-occupancy evaluations of RCFs are essential, and the knowledge gained from one project constitutes an important basis for future projects. Post-occupancy evaluations can also be used to identify factors in the environment that require changes or modifications in existing RCFs (Barnes 2002). Even though environmental features might be difficult to change after a building is completed there are examples of modifications to the environment that can be easily implemented such as furniture placement to encourage social interaction, the use of colour contrasts to highlight walking paths (Geboy 2009, Wijk 2001), and cues and reference points as exemplified in Figure 6.

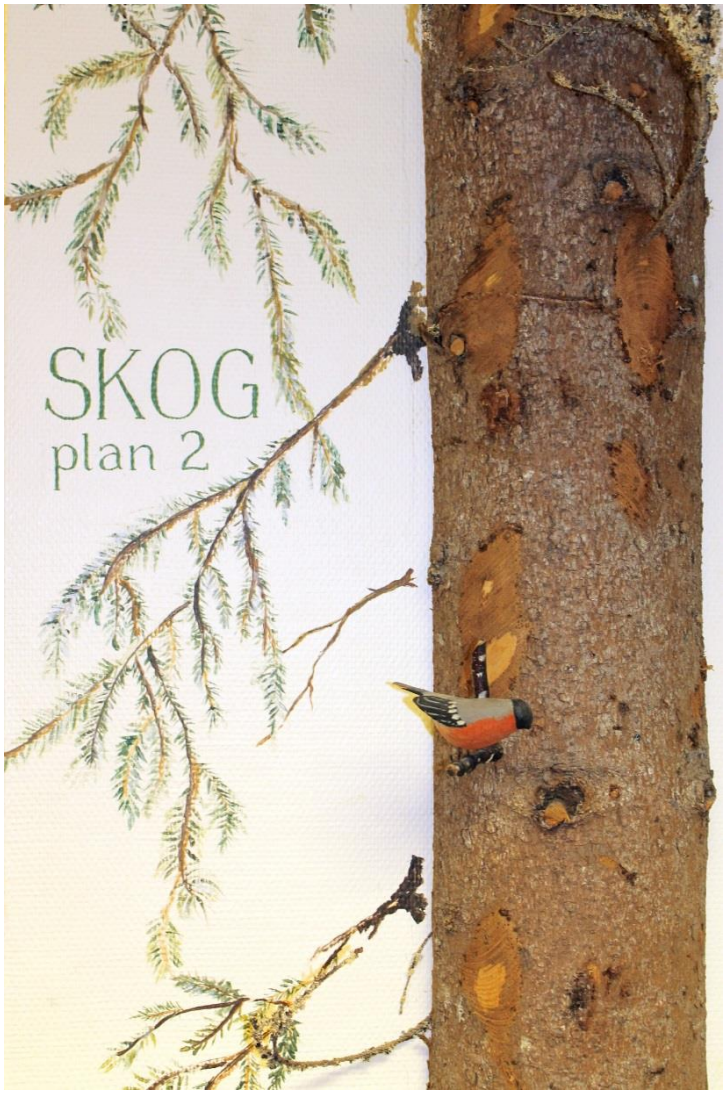

Figure 6. Photo: Susanna Nordin

5.1.2 Environmental aspects and resident activity and interaction

The findings showed differences between RCFs with regard to activities and interactions. Perhaps surprisingly, a higher activity level was found in the non-renovated RCF compared to the newly renovated RCF. For example, residents in the former RCF were seen more often in different locations within and around the facility compared to the newer RCF. An open-plan design and access to the elevator were some features in the physical environment in the older RCF that seemed to influence the residents' opportunities to move around.

What is notably is that despite high environmental quality in both the studied RCFs in terms of Safety and Physical Support, several barriers restricted the residents' activities and limited their accessibility. For example, in the newly renovated RCF locked doors or closed doors without an automatic door opening constituted barriers for residents. The results are echoed in previous studies showing that aspects in the physical environment can influence people's accessibility and usability and that details in the physical environment can be highly problematic for older people with frail health (Barnes et al. 2012, Helle 2013). These results are worrying, especially since great efforts had been made to improve the facility, and most likely at high financial costs. Clearly, there is a need to discuss the goal with a care facility and its intended use. This requires interdisciplinary work that involves different professions with knowledge and interests in high quality design (i.e healthcare professionals, architects, buildings planners) together with older people themselves.

Another finding demonstrated that residents spent most of the time by themselves in their private apartments, which replicated the findings of previous studies (den Ouden et al. 2015, McKee et al. 1999, Bowie and Mountain 1993). After moving into a RCF, many older people become less involved in activities than they were previously in their lives, and there is often a decreased involvement in social activities outside the RCF. Another explanation might be that the number of roles a person has decreases compared with earlier in life (Winblad et al. 2016), i.e. roles of being a parent, a colleague, a husband or a wife. Older people in RCFs have also reported that they experience a lack of stimulating activities that are tailored to their needs (Popham and Orrell 2012), and this is particularly the case for people with dementia who have few options to engage in activities adjusted to meet their needs (Rocha, Marques, Pinto, Sousa and Figueiredo 2013). Findings from a large observational study showed that people with dementia spent most of the time withdrawn from others, and they were engaged in social interactions only two minutes out of six hours during the daytime (Ballard et al. 2001). However, not all people want to socialize and spend time in common areas together with others. Therefore, the care facility should be designed to meet the needs of older people with diverse abilities and preferences.

The results also showed that gardens and other outdoor spaces had relatively low scores on S-SCEAM, and an unexpected finding was that four out of the twenty RCFs did not have a garden at all. Moreover, the findings revealed that barriers such as thresholds and heavy doors limited residents' access to gardens and outdoor spaces (see Figure 7). Infrequent

outdoor visits have been reported for people in RCFs (National Board of Health and Welfare 2015b, Rodiek 2013), and residents' opportunities to get outdoors decreased after relocation to RCFs (Stoneham and Jones 1997, National Board of Health and Welfare 2012a). This is alarming due to the fact that outdoor visits are of particular importance to older people with high levels of frail health (Ottosson and Grahn 2013). Exposure to outdoor environments and garden visits has been shown to improve mood and sleep quality (Rappe and Kivelä 2005), and to promote activities and social interactions (Raske 2010). Moreover, contact with nature can enhance the well-being of people with cognitive impairments and dementia (Cox, Burns and Savage 2004, Rappe and Topo 2007).

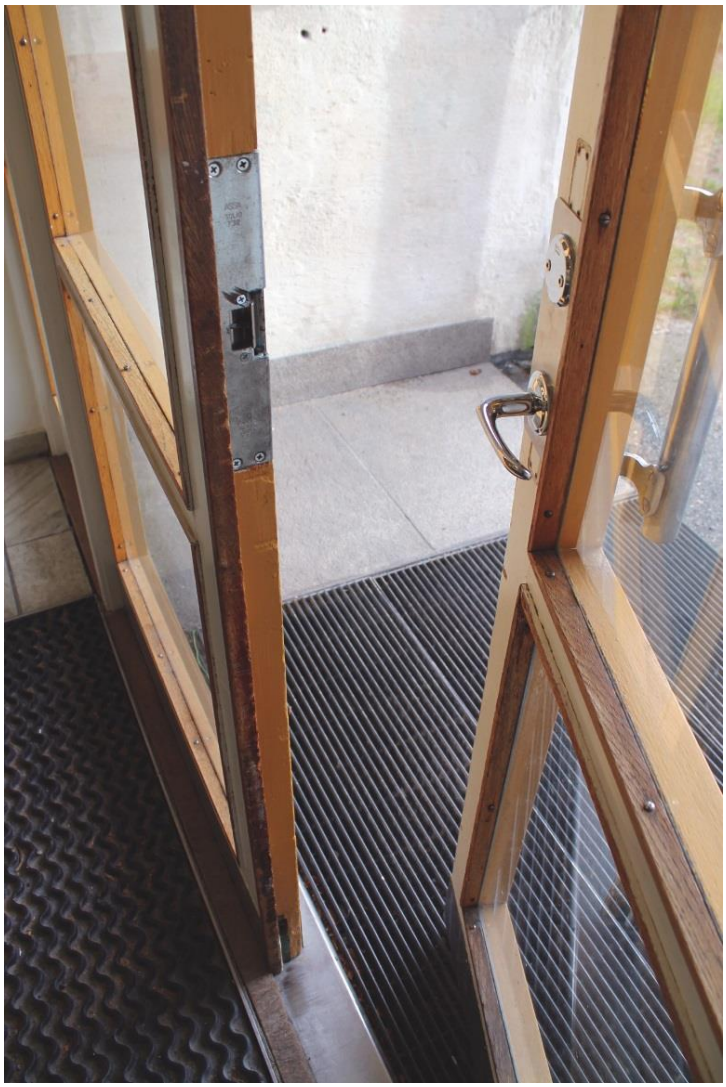

Figure 7. Photo: Susanna Nordin

A lack of assistance from staff and poor weather conditions have been reported as the main hindrances to outdoor visits (Rappe, Kivelä and Rita 2006) together with barriers in the physical environment (Rodiek 2013). Thus, it is of huge importance to design gardens and outdoor areas that are accessible for residents with different needs and health conditions so as to promote their involvement in activities and support their independence in the environment. The outdoor area need to be distinct and welcoming and include walking paths that make it

safe for older persons to use it on their own as much as possible. Poor design would perhaps be relatively easy to modify or improve, and environments that are accessible and usable might compensate for understaffing to some extent. However, the design of the physical environment is supposed to support good care, and there are no design solutions that can compensate for a bad quality of the care.

Of course, it could be argued that open doors and free access to outdoor spaces might be unsafe for people with cognitive impairments and dementia, and this issue has recently been under debate in media. However, it is essential to discuss these issues further with the goal to design safe and secure environments without restricting freedom, choice and autonomy among older people living in RCFs. For example, Bengtsson (2015) has suggested that residents with cognitive impairments can benefit from access to a sheltered garden since they might be more vulnerable to overstimulation, whereas people with higher functioning often appreciate contact with events outside the facility (Bengtsson 2015). Additionally, there has been an increasing interest in technical solutions and web-based tools that can be built into the environment, and new technology can offer valuable opportunities in different contexts, not least in RCFs for older people.

An interesting finding was that the residents were engaged in passive social interactions such as observing people moving around in the facility, following events outdoors or watching care staff performing their work duties. This suggests that it might be time for more nuanced thinking when it comes to activity where the focus should be more on residents' social abilities rather than on their physical abilities. Therefore, the design of the physical environment can be assumed to be of crucial importance for opportunities for spontaneous activities or for following daily life events within and around the facility. Previous studies have shown that older people in RCFs might not be interested in organized group activities (Donovan et al. 2014, Ice 2002), and that social interaction with others is a more valued activity (Andersson, Pettersson and Sidenvall 2007, James et al. 2014). Going out for a walk or helping out with common everyday tasks in the RCF have also been found to be valuable for residents with dementia (Popham and Orrell 2012). Moreover, many people living in RCFs today have high levels of frail health and engagement in social interactions or passive involvement in activities might therefore be a way to enhance well-being. This is in line with a person-centred approach (McCormack, Dewing and McCance 2011) offering care environments that supports the needs and preferences of residents and that enhance their engagement in activities of their own choice.

5.1.3 Lower environmental quality in terms of privacy

The results showed that the quality of the physical environment in terms of privacy had relatively low scores across RCFs. In general, the findings showed that the private apartments were of high quality. However, privacy tended to be poorer in other facility locations such as lounges. Open-plan solutions with lounges and dining areas next to each other without walls in-between were commonly seen in RCFs. This type of design enables staff to have clear

views of shared spaces but can at the same time infringe on residents' privacy. Thus, there should be an emphasis on designing RCFs in such a way that residents do not feel supervised.

The ambition that older people should be able to maintain their privacy after moving into a RCF has been given great focus in Sweden (National Board of Health and Welfare 1996) as well as in other countries (Schwarz 1999) and is emphasised in many guidelines and legislations in the care of older people (Rijnaard et al. 2016). It is essential to provide opportunities for residents to be themselves and to do what they want (James et al. 2014, Nakrem, Vinsnes, Harkless, Paulsen and Seim 2013, Popham and Orrell 2012). Being respectful of a person's integrity is a core value within person-centred care and is implemented in care values, whereas the underestimation of people's integrity is regarded as being a severe threat to well-being (National Board of Health and Welfare 2012b).

In many European countries, RCFs offer private apartments to their residents and this allows residents to personalise their rooms with their own furniture and memorabilia, while enabling them to withdraw from others (Rijnaard et al. 2016). Although this is highly important, there is a need to also create private spaces in common areas. For example, large communal areas can be separated into smaller areas that enable residents to remain private and the suggestion is that this supports the residents' use of different spaces within the RCF based on their needs.

5.1.4 Supporting normalness

Interestingly, the results showed that the quality of the physical environment in terms of Normalness (e.g. space for personal belongings or discretely integrated safety devices) was related to care quality in terms of everydayness. This means that in RCFs promoting familiarity and minimizing an institutional character, the residents perceived a sense of homeliness and had greater opportunities to focus on things other than health problems. Accordingly, these findings indicate that a familiar and homely physical environment can support person-centred care and in turn the well-being of older people. These findings corroborate previous research highlighting the importance of providing familiar and domestic environments (Joseph et al. 2015, Fleming, Goodenough, Low, Chenoweth and Brodaty 2014). However, there seems to be difficulty achieving a sense of homeliness in RCFs for older people. Although the S-SCEAM mean scores for Normalness were relatively high in general, a common view was a mixture of styles in the RCFs. Most likely, the care staff attempted to create a homelike environment by placing items or furniture in the communal areas that the residents might be familiar with. An example of such an environment can be viewed in Figure 8. Difficulties in disguising the institutional character in RCFs have also been reported in previous research (Popham and Orrell 2012).

Small-scale RCFs that are not obviously institutional in design can positively influence residents with high levels of frail health (Joseph et al. 2015). Private apartments are often regarded as most valuable in preserving normalness (Nakrem et al. 2013). However, some apartments were very small, and obviously this will set physical limitations on what

sentimental possessions and furniture residents can bring in (Nord 2011). Moreover, social interactions and contact with family might also be reduced due to restricted personal space. Small apartments probably reflect an earlier era in which people living in RCFs were more independent and were expected to socialize in communal areas within the facility. Today, many residents are very frail and have high care needs, and this might indicate the need to build larger apartments that allow for aids and assisting devices, as well as space for social activities and family visits.

Figure 8. Photo: Susanna Nordin

5.1.5 High environmental quality in terms of safety and comfort

The findings showed that the S-SCEAM Safety domain had the highest mean score of all the domains across RCFs Strong emphasis on safety aspects has been demonstrated in previous studies in similar settings (Parker et al. 2004, Torrington, Barnes, McKee, Morgan and Tregenza 2004). Some plausible explanations for this could be that safety aspects are concrete and easy to implement when designing care facilities, and that safety issues are traditionally highly valued in healthcare buildings. However, there were large differences across the RCFs and also within the same RCF, with a majority having higher quality in terms of safety in domestic locations such as private apartments and dining areas. This finding is reassuring since many residents spend a considerable amount of time in such locations which is in line with previous studies (den Ouden et al. 2015, McKee et al. 1999, Bowie and Mountain 1993).

However, other studies have demonstrated that care facilities in which there is strong focus on safety aspects can have a negative impact upon older people's well-being and can limit activity and choice (Parker et al. 2004). Therefore, it is highly important that RCFs are designed to be safe and secure so that all residents can live a life in accordance with their personal needs and desires, and without the risk of their autonomy and independence being reduced. Again, this highlights the importance of also considering organizational factors. By tradition, safety is a concern among care staff and care home managers that might result in restricted use of the facility. Thus, the design of the physical environment must go hand in hand with organizational factors.

5.1.6 Quality aspects and evidence-based design

Despite the fact that the physical environment has a major impact on the daily life and well-being of older people (Lawton and Nahemow 1973, Rowles and Bernard 2013), no instrument assessing the quality of the physical environment has previously been available in Swedish (Elf et al. 2015c). This instrument enables environmental assessments and has great potential for use in discussions among stakeholders such as building planners and architects involved in planning and designing RCFs, and also among care home managers and care staff as a way to increase the awareness of environmental aspects in daily care. Although there is a desire among these professional groups to influence the design process, it can be difficult to achieve creative dialogues. Many professionals are oriented towards practical work and have limited experience of using evidence-based design (Elf et al. 2015b, Elf et al. 2015a). Thus, S-SCEAM can be a valuable instrument with a potential use in such dialogues.

Defining the quality of the physical environment is problematic, with definitions varying between users and across contexts. An argument in the present work is that the S-SCEAM can assess environmental quality in RCFs, and this argument is based on the idea that a high quality facility can support the needs of its users and enhance their well-being. However, the instrument contains predetermined items that can be responded to by yes or no, and it does not involve any qualitative part allowing for other aspects that might be important in the physical environment. Factors related to sustainability and ecological values are gaining increasing interest in architecture and are described as design-quality indicators (Anåker et al. 2016). For instance, ways to reduce energy consumption in RCFs are not very well captured by the S-SCEAM instrument. Quality is also a matter of time, that is to say, aspects that are regarded as high quality today might be out of date tomorrow. For example, technical aids and information systems will increasingly be important factors for high-quality environments.

Nevertheless, by means of the S-SCEAM assessments, it is possible to use the results and provide feedback to professionals involved in design processes so that these results can be used in future projects (Zimmerman and Martin 2001). This is a crucial part of EBD and is described as follows:

"Without a feedback loop, every building is, to some extent, a prototype – spaces and systems put together in new ways, with potentially unpredictable outcomes" (Zimmerman & Martin, 2001, p 169).

EBD also emphasises the need to acknowledge the perspectives of professional groups such as architects and healthcare professionals, as a means to achieve the best possible outcomes (Kasali and Nersessian 2015, Elf et al. 2015b). Fleming and colleagues (2012) found that RCFs that were designed with input from care home managers who had knowledge on evidence-based design principles resulted in significantly higher environmental quality. The authors demonstrated the importance of knowledge exchange between the professionals involved as well as the fact that architects should be more active in sharing their knowledge with others (Fleming et al. 2012).

5.1.7 Some final reflections

The idea of supporting older people through the physical environment is not new. Lawton and Nahemov presented their ecological model on ageing over forty years ago and emphasised the need for a balance between the older person's competence and environmental press (Lawton and Nahemow 1973). However, this theory has sometimes been criticized for being too simplistic and for lacking a precise strategy to assess the person-environment relation (Gitlin 2003, Golant 2003). An instrument such as S-SCEAM offers detailed quality assessments of the physical environment which can contribute to the concretization of Lawton and Nahemov's model. By providing a comprehensive picture of the physical environment through the use of S-SCEAM in RCFs, specific environmental aspects can be identified and used in analyses to determine which aspects affect which resident outcomes.

The substantial variations found between the RCFs mean that some facilities will support the needs of older people better than others. Although there were few associations between characteristics of the RCFs and environmental quality, the findings showed that the quality of the physical environment was lower for older RCFs with regard to formal locations (Overall Building Layout, External/Entrance, and Garden). This may indicate that something has been learned over the years, and there has been a fundamental transformation in long-term care with a movement away from viewing RCFs as institutions towards having a more person-centred perspective of care facilities as homes. Despite this profound change in attitude, there is still a long way to go before this change in attitude has tangible results (Koren 2010). During visits to the 20 RCFs, a common sight was that of the endless corridors that all looked the same. Another example was door signs with information that this was a storage space for diapers, see Figure 9. These environmental features do not correspond particularly well to a person-centred approach in which the physical environment is supposed to facilitate the life of residents and support personal needs, preferences and relationships.

Figure 9. Photo: Susanna Nordin

On the other hand, promising examples of environmental quality were also found, one being the fact that the newest facility in the sample was the one with the highest overall score and the one that had the highest quality in terms of Cognitive Support. In this RCF, different colours were used at each unit, and included the walls, furniture and porcelain. This way of using colours can facilitate for the residents to find their way around and for continuity, and it also gave a welcoming and nice impression when entering the units. This is exemplified in Figure 10.

Figure 10. Photo: Susanna Nordin

Finally, a natural question would be: What is the design of the perfect care home? Of course, this is not easy to answer. During the work with this thesis, the importance of the physical environment for the highly heterogeneous group of older people has become more obvious to me. For example, the provision of physical environments that enable residents to live their life in accordance with their personal needs, desires and preferences is essential. Hopefully the results from this thesis will contribute to an increasing awareness of and discussion on how to create high-quality care facilities supporting the different needs of older people. A few days ago, I asked my father Björn and his partner Lillemor what would be important to them if they had to move into a care home. My father talked about opportunities to engage in leisure activities, while comfort and homeliness were the most important aspects for Lillemor. I think we need to remind ourselves that even as people age and frailty increases, they maintain many of their interests and abilities, and the physical environment has a major role in enabling residents to live a meaningful life despite cognitive and physical frailties. The words of John Zeisel (2013) capture the essence of this:

"The more a person's environment supports his or her capacities, the more a person will act upon and feel a level of independence. The more a person acts successfully in their environment, the more they will continue to do so. The more a person behaves independently and uses their capacities, the greater is their sense of self. The more caregivers and partners see the person as independent, even marginally, the more they treat the person as a person, not as a patient" (Zeisel 2013, p 52).

5.2 Methodological considerations

Research on environmental quality and how it relates to resident outcomes is complex and multifaceted. The present thesis incorporated several research questions, and it was essential to apply a multi-method design in order to respond to these questions. It has also been suggested that a combination of different methods in a given study decreases its limitations and weaknesses (Creswell and Plano Clark 2011). Nevertheless, the research design and methods employed require a critical discussion. This section will start with issues related to the methods involved in the development of S-SCEAM, as the quality of this work will certainly have affected the results of the other studies in which the instrument was used.

5.2.1 Methodological issues of instrument translation and adaptation

Validity and reliability are two major quality criteria in instrument development. Validity refers to the ability of an instrument to assess what it is intended to assess, whereas reliability addresses the overall consistency of an instrument (Polit and Beck 2012). Good validity and good reliability are required for high-quality research. The translation and cultural adaptation of SCEAM into S-SCEAM involved the examination of validity and reliability issues (Study I) and will be discussed in the following paragraphs.

Although there is no golden rule on how to translate and adapt an instrument from one culture to another, many authors recommend using multiple methods (Wild et al. 2005, Maneesriwongul and Dixon 2004). It was important to retain the same meaning of the items in the translated version, and Polit and Beck's (2012) recommendation of forward and backward translation was followed to ensure conceptual and semantic equivalence between the two versions (Polit and Beck 2012). Since one of the research group members (KM) was involved in the development of the original SCEAM, discussions on items and concepts were able to clarify underlying meanings. Another strength of the translation and adaptation process was the consultation with experts from different disciplines with a broad range of expertise and knowledge. Both quantitative and qualitative data were gathered from the expert group. The CVI analysis was very useful at the initial phase of adaptation since it provided valuable information on the relevance of each item (Polit, Beck and Owen 2007). CVI was used as a basis for discussions and reflections, but qualitative data were also collected in terms of written comments and interviews with the experts. This was most valuable for increasing understanding as to why some items had low relevance ratings and also for raising awareness of issues raised by the experts that were not detected by the instrument. Moreover, the qualitative data revealed other problems with the instrument such as unclear wording and poor structure. Thus, the combination of quantitative and qualitative data was seen to be a strength in Study I.

A weakness with Study I was that the demonstration of validity was limited to face and content validity. CVI was used in Study I, and it is a common method for the quantifying of content validity based on relevance ratings by experts. However, it has several limitations. CVI measurement is influenced by all aspects of the evaluation process, not only by the

validity of the construct of interest. Thus, in addition to items that do not reflect the underlying construct, plausible reasons for low CVI values can be information that is inadequate for the experts or an expert group that is not knowledgeable about the topic. CVI has also been criticized for not adjusting to chance agreement among raters and for the fact that it only focuses on the items at hand, meaning that there is no guarantee that the instrument captures the optimal set of items reflecting the construct of interest (Polit et al. 2007).

Reliability tests were performed to determine the stability and equivalence of the instrument, and these tests included test re-test and inter-rater reliability tests between two raters. Although these tests were only performed at one RCF, several units were assessed with varying environmental layout. The raters discussed the items and practised the S-SCEAM assessments prior to performing the reliability tests. In accordance with recommendations in literature (McHugh 2012), both Cohen's kappa (κ) and percent agreement were used since the latter does not account for chance agreement (Stemler 2004). Moreover, the internal structure of the revised instrument was investigated by experts, who allocated each item to one of the domains.

Further, there is an inherent ambiguity in environmental assessments as these tend to be subjective rather than objective. For instance, it is easy to assess a precise quantity such as room size, whereas other important aspects might be more problematic to define (Torrington 2007). In S-SCEAM there are several items that are subjective by nature and can result in different scores depending on the rater. The following items exemplifies this:

- *Does the interior design contribute to a sense of homeliness?*
- *Is the care facility designed to look like a regular residence?*

Therefore, when using the S-SCEAM instrument it is important to use a manual with definitions and examples. Developing such a manual remains to be done.

5.2.2 Design and sample procedure

A cross-sectional design was chosen as the thesis's research questions did not require a longitudinal design, which are almost always resource-intensive. Cross-sectional designs have limitations, however, as the data are collected at a single time-point, meaning that cause and effect cannot be differentiated (Mann 2003). The use of longitudinal studies could be beneficial for an exploration of causalities such as the impact of the physical environment on older people's well-being. Yet, other problems can arise when research is being conducted over a long time period that involves older people: for example, there is the risk that people drop out of a research study due to age, that their health declines or that they even die (Chatfield, Brayne and Matthews 2005).

The present thesis was comprehensive and involved 20 RCFs and more than 200 residents. Yet, the number of 20 RCFs must be regarded as small (Study II and Study IV). A strength of the thesis was the purposive sampling strategy with the intention to include RCFs with varying building designs, years of construction, building sizes, types of ownership, and geographical locations. However, as the RCFs were not randomly selected, the sample cannot be viewed as being representative of Swedish RCFs. All residents were recruited through the care home managers at each RCF, and although the managers were provided with detailed instructions, it is likely that some bias was introduced into the sample. For example, managers could have – consciously or unconsciously – selected those residents who would put the RCF in a favourable light when answering questions or selected those residents who were the most independent and healthy.

5.2.3 Instruments and questionnaires

Several instruments and questionnaires were used in this thesis, and the following are discussed below: PES-AD and MMSE-SR. Data on residents' social well-being were collected using the PES-AD. There was no Swedish version available and for the purpose of this thesis, the instrument was translated into Swedish by the author of this thesis (SN). However, using an instrument that is not culturally validated can pose severe threats to validity. To reduce this risk, the translated version was pilot-tested and discussed within the research group, and adjusted prior to data collection. Another issue was that the PES-AD was a proxy assessment instrument, which is regarded as being less valid compared to self-reported assessment instruments (Rabins and Kasper 1997). However, the reason as to why data were collected via proxy was to minimize the demand on the older people. The well-recognised and widely used MMSE-SR was found to pose some difficulties for the residents in this thesis due to high levels of frailty (Study IV). To manage the occurrence of missing values, percentage was used in the analysis to show the proportion of completed items of the MMSE-SR

5.2.4 Trustworthiness of observations and interviews

Using observations has many advantages, such as yielding valuable insights and understanding of real-life situations (Silverman 2013). However, observations involve several risks of bias. The observer's subjective interpretations can result in the selection of certain events or situations and the deselection of other aspects. Another risk is that the observer's physical or emotional state can affect how a phenomenon is perceived. Moreover, participants' awareness of being observed may change their normal behaviour (Sommer 1968, Parsons 1974). Thus, the trustworthiness of the methods included in Study III needs consideration and will be discussed in the following paragraphs.

Credibility has been regarded as the most important aspect of qualitative research and refers to confidence in the truth of data and how data are interpreted (Polit and Beck 2012). Unstructured non-participant observations and informal interviews were used to understand the older people's activities in relation to the physical environment (McKechnie 2008). This

was regarded as being an appropriate method to achieve a comprehensive understanding about the phenomena being studied with a minimum of interference in the activities from the researcher. To strengthen credibility, observational field notes and notes from the informal interviews were written during and after the observations. Field notes were collected from two observers (SN and MW) and were discussed continuously during the data-collection period. The analysis of the qualitative data was also discussed and reviewed by a third member of the research group (ME). Photographs of different spaces and features in the physical environment were also used as support for memory. Dependability refers to the stability of data over time and under different conditions (Lincoln and Guba 1985). One way to strengthen dependability was to use both unstructured observations and informal interviews, and another way was to describe the steps in the analysis.

Transferability is about the extent to which the findings can be applied to other settings or to other groups (Polit and Beck 2012). The characteristics of the two RCFs and the residents involved in Study III were thoroughly described so as to provide the reader with adequate information. For example, environmental characteristics such as building location, building size and provision of different areas were described as were organizational factors (e.g. resident and staffing profiles, core values and activities). Confirmability refers to objectivity and concerns the accuracy, relevance or meaning of the data (Polit and Beck 2012). Although almost all data were collected by the author of this thesis, field notes were also made by another person (MW). The material was read and reviewed by a third member of the research group (ME), who was actively involved in the analysis. To further strengthen confirmability, quotations from field notes and informal interviews were presented (Polit and Beck 2012).

5.2.5 Generalisability of study findings

The environmental assessments, observations, questionnaires and interviews were all performed in a Swedish context, and the results from this thesis may not reflect the situation in other countries. The relatively small sample of RCFs and the purposive selection of facilities are also factors that need to be considered in the discussion on generalisability. However, the characteristics of the residents in this thesis follow the general descriptions of the population of older people being admitted into long-term care. This applies to Sweden as well as to other countries.

To conduct research that involves highly frail, older people living in residential care facilities is difficult and complex, which might explain the limited body of research in this field. Such research requires careful preparation and methods that are thoroughly planned. Of utmost importance was access to care facilities and the opportunity to be physically on site in the older people's living environments. Several strategies were used to make this research possible. To ensure variation with regards to characteristics of the RCFs, purposive sampling was used. The facilities included in the research represented urban and rural geographic locations; different types of organizations; and varying building designs, building sizes and building ages. Together, these fulfilled the ambition of a great variety of RCFs in the sample.

5.3 CONCLUSIONS AND IMPLICATIONS

Overall, the results from this thesis contribute to our understanding and knowledge of the physical environment of care facilities and the way in which it influences residents' activities and well-being. This is especially important today with an ageing population, which is resulting in a growing proportion of older people with physical and cognitive frailties and chronic conditions. This development will put considerable demands on the healthcare system, including high-quality care facilities for older people. The importance of creating care facilities that promote resident well-being has been increasingly emphasised, and the current healthcare policy in Sweden and internationally is based on a person-centred approach in which the needs, preferences and life situation of the individual are central. Moreover, constructing and renovating care facilities for older people entails substantial economic costs to society and thus RCFs need to be designed so as to be sustainable over a long period.

- This thesis contributes with an instrument for use in a Swedish caring context for the assessment of the quality of the physical environment in RCFs for older people, the Swedish version of the Sheffield Care Environment Assessment Matrix (S-SCEAM). Although further tests are required, the S-SCEAM in its current form possesses good reliability, good face validity and good content validity.

- S-SCEAM can be used as a design guide in the early stage of the commissioning process of a RCF, and as support for interdisciplinary discussions between representatives from architecture, engineering, and healthcare.

- S-SCEAM provides detailed environmental assessments and is sensitive to variations between and within RCFs, and can be used in existing RCFs to identify specific environmental features in need of improvements. Different stakeholders, such as nurses or care home managers, can benefit from using the instrument in their practical work so that they can receive information to monitor their facility and the way it supports the needs of the residents. This information can serve as a basis for discussions with care staff to improve and adjust features in the physical environment.

- This is the first research thesis in Sweden to explore the quality of the physical environment in RCFs using S-SCEAM and the association between the performance of RCFs as assessed by S-SCEAM and the activities and well-being of residents. The associations found can inform building designers, architects and healthcare professionals in their work when planning RCFs for older people. This can result in an awareness as to what aspects of the physical environment are of particular importance to residents with frail health, such as Cognitive Support. Thus, environmental features that provide support for older people with cognitive frailties need to be emphasised in the planning and design of new care facilities or in renovation or refurbishment work.

- Several environmental features can restrict resident activity and interactions in RCFs; the needs of residents with high levels of frail health will be particularly affected by such features, and their needs must be taken into account in the design of RCFs to ensure accessible and usable environments for all residents.

5.4 FUTURE RESEARCH DIRECTIONS

This work has raised questions and ideas for future studies. As the results show that S-SCEAM is a promising instrument in the evaluation of Swedish RCFs, the suggestion is that it may be of use in other research studies.

An idea that came up early in the work with this thesis was to use the S-SCEAM in an intervention study. An environmental modification could be followed in a selected RCF and compared to controls without modifications. For example, modifications could include the adaptation of lighting conditions, a change in colours, or more comprehensive changes. The S-SCEAM can also be used to study outcomes other than residents' well-being – for example, health or recovery. Moreover, associations between environmental quality and the quality of care might be most valuable to explore in future studies, as the care provided can influence the well-being of care recipients. Further, it might be interesting to expand the use of S-SCEAM to other contexts, such as psychiatric care or palliative care. These are important areas in which the quality of the physical environment is most likely to have a great impact on its care recipients.

In general, there is a need for more research involving the views of older people on aspects that matter to them. Although the domains in S-SCEAM are seen to represent the needs of older people, it would be most interesting to seek the views of older people regarding important factors in the physical environment in relation to environmental quality assessments and whether these coincidence. In the current thesis, observations of and interviews with residents provided important data on the relationship between the person and the environment, and this could be further studied by way of focus-group interviews or in-depth interviews with older people.

Another important research area is the physical environment of the homes of older people. Despite high levels of frail health, a majority of older people remain in their own homes and may require substantial assistance and aids in their daily lives. Thus, it is important to obtain more knowledge as to what aspects in the environment are important according to the older people themselves. Such knowledge is central to an increase in the opportunities they have to live as independently as possible.

Although the S-SCEAM showed itself to be valid and reliable, there is a need for further testing of the instrument. For example, criterion validity can be examined in research studies by comparing results from S-SCEAM assessments with other instruments. Nevertheless, the comprehensive procedure with translation and adaptation has arguably improved the original instrument, and might provide a stronger foundation for future developments of the instrument in new contexts or in other countries.

6 SVENSK SAMMANFATTNING (SUMMARY IN SWEDISH)

Många äldre personer som bor på äldreboenden idag har mycket skör hälsa i form av fysiska och kognitiva funktionsnedsättningar och det är vanligt med flera sjukdomstillstånd samtidigt. Detta påverkar vardagslivet och välbefinnandet i stor utsträckning. Många tillbringar en stor del av sin tillvaro inom boendet och utformningen av den fysiska miljön kan därför antas ha särskilt stor betydelse för dessa personer. Enligt forskning finns en rad faktorer i den fysiska miljön som har en positiv inverkan på äldre människors välbefinnande såsom tillgång till dagsljus, god belysning, adekvata ljudnivåer och kontakt med naturen. Samtidigt kan bristande kvalitet på den fysiska miljön leda till försämring i hälsa och välbefinnande och resultera i lägre grad av självständighet. Den fysiska miljön är en central del i ett person-centrerat förhållningssätt och kan skapa förutsättningar för att stödja personers olika behov, preferenser och livssituation och utgör en viktig grund för äldres aktiviteter och sociala interaktioner. När äldreboenden har tagits i bruk utvärderas de sällan och det finns inte så mycket kunskap om kvaliteten på den fysiska miljön. Följaktligen saknas kunskap om hur miljön kan inverka på personerna som bor där och det sker ingen återkoppling till exempelvis byggnadsplanerare och arkitekter hur utformningen av den fysiska miljön fungerar i praktiken. En anledning till detta kunskapsgap är en begränsning av tillförlitliga mätmetoder och i Sverige har det inte funnits något valitt och reliabelt instrument för att bedöma den fysiska miljöns kvalitet inom äldreboenden. Det är av stor betydelse att få mer kunskap om hur den fysiska miljön kan stödja behoven hos äldre med skör hälsa för att öka deras välbefinnande.

Det övergripande syftet med denna avhandling var att fördjupa kunskapen om kvaliteten på den fysiska miljön inom äldreboenden i förhållande till äldres aktiviteter och välbefinnande. Sådan kunskap kan bidra till en mer heltäckande bild av förhållandet människa – miljö. Data samlades in på tjugo svenska äldreboenden runt om i landet med olikheter vad gäller byggnadsutformning, byggnadsår, storlek, organisationsform och geografiskt läge. Ett flertal olika datainsamlingsmetoder användes, exempelvis frågeformulär, intervjuer och observationer. I avhandlingsarbetets inledande fas genomfördes instrumentutveckling och kulturanpassning av ett engelskt instrument för bedömning av den fysiska miljöns kvalitet inom äldreboenden.

Delstudie I resulterade i det första validerade och reliabilitetstestade svenska instrumentet för bedömning av fysisk miljö inom äldreboenden. Instrumentet låg sedan till grund för datainsamlingen i de övriga delstudierna i avhandlingen. Instrumentet utgår från ett person-centrerat förhållningssätt och inrymmer miljömässiga aspekter som enligt forskning har visat sig ha stor betydelse för äldre personer med skör hälsa. Några exempel är i vilken utsträckning äldreboendet stödjer den äldre personens privatliv, trygghet, trivsel och valmöjligheter i miljön. Fysiskt stöd och kognitivt stöd är andra exempel på viktiga aspekter i den fysiska miljön. I **Delstudie II** undersöktes kvaliteten på den fysiska miljön inom de tjugo svenska äldreboenden som ingick. Resultaten visade stora kvalitetsmässiga variationer mellan äldreboendena, och även mellan olika utrymmen inom ett och samma äldreboende. De

områden som hade hög kvalitet var främst privata lägenheter och måltidsutrymmen, medan utomhusmiljöer och övergripande byggnadsutformning hade lägre kvalitet. Förbättrings-områden kunde identifieras såsom kognitivt stöd och möjlighet att vara privat, och båda dessa aspekter visade låg kvalitet generellt. I **Delstudie III** genomfördes observationer på två äldreboenden. Resultaten gav djupare kunskap om förhållandet mellan fysisk miljö och äldres aktiviteter. Resultaten visade exempelvis att de äldre var socialt inaktiva en stor del av dagen och tillbringade sin tillvaro främst i den egna lägenheten, samt att tillgänglighet och möjlighet att använda den fysiska miljön hade betydelse för de äldres aktiviteter. Trots hög kvalitet generellt så kunde detaljer i miljön såsom trösklar och tunga dörrar begränsa de äldres möjligheter till aktiviteter. I **Delstudie IV** studerades relationen mellan kvaliteten på den fysiska miljön och äldres välbefinnande. Resultaten visade att det fanns ett samband mellan miljöns kvalitet i form av kognitivt stöd och de äldres sociala välbefinnande. En kognitivt stödjande fysisk miljö betyder att miljön behöver vara tydlig och enkel att tolka för de äldre genom exempelvis referenspunkter eller färgkodning, och detta kan relateras till äldres sociala aktiviteter som exempelvis att vistas utomhus, att hjälpa till på äldreboendet, att lyssna på musik eller att umgås med vänner.

Sammanfattningsvis har ett nytt bedömningsinstrument utvecklats inom ramen för denna avhandling. Instrumentet möjliggör bedömning av fysisk miljö inom svenska boendemiljöer för äldre och kan användas i dialogen mellan representanter för vård och arkitektur redan i byggnadsplaneringen och för att bedöma kvaliteten på miljön i befintliga boenden inför renovering och utveckling. Det kan också användas i forskning och kvalitetsutveckling för att exempelvis undersöka den fysiska miljöns kvalitet i förhållande till vårdkvalitet och hälsa hos personer som bor på äldreboendet. Resultaten från avhandlingen har också visat att den fysiska miljön har betydelse för äldres välbefinnande och för deras aktiviteter. En sådan kunskap anses nödvändig för att bättre kunna möta behoven hos äldre personer och kunna erbjuda en jämlik vård. Kunskapen har även betydelse ur ett samhällsekonomiskt perspektiv då nybyggnation och renovering av äldreboenden innebär stora kostnader.

7 ACKNOWLEDGEMENTS

First and foremost, I am sincerely grateful to all participants who made this thesis possible by giving me their time and sharing their perceptions. Further, the realization of this thesis would not have been possible without the kindness and willingness of the care home managers and care staff who supported me in practical terms and who gave me access to their care facilities.

I would like to express my deep gratitude to everyone who helped influence this thesis and who contributed in various ways, either professionally or personally, or indeed both. I would especially like to thank the following people:

Associate Professor *Marie Elf,* my main supervisor, for your dedication and the true joy you had for our work which has inspired me from day one. You have always been a step ahead and helped me to widen my perspectives on many occasions. Being a doctoral student has meant professional progress as well as personal development, and your continuous support and confidence in me have given me the courage to step outside my comfort zone.

Associate Professor *Helle Wijk,* my supervisor, for your outstanding ability to always highlight the positive in everything. Your enthusiasm and sincere interest have been of great value over the past six years, and I am privileged to have got to know you. I have also had the opportunity to attend a variety of conferences in Europe and even one in Australia together with you, and let's see where we end up next time.

Professor *Kevin McKee,* my supervisor, for your great source of motivation and encouragement in this research project. The guidance and good advice I received from you have been most valuable, not least when I took my first steps into the field and into the care facilities to begin my data collection. Over these past years, our group has held many research meetings, always spiced up with your English humour.

Professor *Lena von Koch,* my supervisor, for your dedication and for sharing your broad scientific knowledge. You have always given me insightful and valuable comments and encouraged me in many ways. As Director for Studies in the Graduate School of Health Care Sciences, NFV, you have also guided me in the choice of all the many interesting courses.

Professor *Anna Ehrenberg,* my mentor, for your energy and enthusiasm, and for always being there for me. Thank you as well for all the interesting and inspiring research seminars at Högskolan Dalarna and for sharing your immense knowledge.

My colleagues and fellow doctoral students, past and present, at Högskolan Dalarna and Karolinska Institutet for all discussions, support and enthusiasm over the years. Special thanks to *Louise Nygård* for welcoming me to "Kreativa Konditoriet" at the Division of Occupational Therapy at KI. I also want to thank *Jan Florin, Malin Tistad, Janeth Leksell, Lena Rosenberg* and *Ann-Marie Boström* for valuable comments on my "kappa". A special

thanks to *Mari-Cristin Malm* who began the PhD journey at the same time as I did: thank you for everything you have done for me. Thanks also to my former "roommates" *Ulrika Byrskog* and *Anna Anåker* for all the things we have shared, the discussions and the laughter. Thanks to my co-author *Maria Wallinder* for the good collaboration, and for sharing your skills and knowledge, not least when it comes to statistics.

My Faculty Director *Lillemor Vallin Eckardt,* at Högskolan Dalarna who made me feel as though I was the only employee! I also want to express my gratitude to the Head of School of Education, Health and Social Studies, *Magnus Jobs.* Special thanks to *Mandy Bengts* for proofreading my thesis on very short notice, and for always having a positive attitude.

All my friends and relatives for simply being there. A special thanks to my parents-in-law, *Lena* and *Rune,* for your generosity and for all the great moments we have had in beautiful Dala Floda. Thanks also to *Örjan* for arranging accommodation for me in Stockholm.

The *Simonsson-Johansson* family for all the great camper vacations and exciting experiences we had together in countries like Spain, France, Croatia and even Ukraine! During the periods of heavy workloads, I always looked forward to our next trip together. Thanks also to the *Alm-Karlsson* family for helping me to recharge my batteries during our annual winter vacations in Vemdalen with skiing, good talks and nice wines.

My dear friend *Carina* whom I have known my entire life. You have the greatest heart of all, and I am so grateful for having you as my friend. Even though you are not familiar with my field of study, you have supported me in many ways over the years. Thanks also to my friend *Åse* for your contagious laugher – after our trip to Liverpool, I think my life must have been extended by several years as a result!

My father *Björn* for being who you are. I am infinitely grateful for your being there and for taking part in everything going on in my life and with my family. You have a genuine interest in people and welcome everyone you meet with an open mind. If more people were like you, then this world would be a much better place to live in. I also want to thank *Lillemor* for your warm heart and for all you did for Grandmother when she was still alive.

My sister *Helena* for always being there for me, both in the bad times and in the good times. You have followed me all the way throughout this journey, and always came with the most sensible advice and comments. I am eternally grateful for having you as my sister and friend. Thanks also to your family, *Atle, Filip* and *Isabella,* for all the great moments we have had.

My husband *Henrik,* my love in life, and our daughter *Louise* and our son *Samuel*. Thank you for your love, support and patience throughout the past six years. Far too many times you have heard me say: Just a minute, I am just going to finish this... You mean everything to me, I love you!

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