Outdoor environments at residential care facilities

Needs, wishes, and access for older adults and care workers

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Dedication

To all older adults, care workers and managers at Swedish residential care facilities whom I have had the privilege of meeting and learning from throughout my years of practice and research: Your insights have sparked my curiosity about the use of outdoor environments and raised additional questions that need to be addressed.

Photo: Unsplash.

'Omnia mirari etiam tritissima'
('Find wonder in everything, even the most commonplace')

Carl von Linné

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ABSTRACT

Introduction: Research studies have shown that contact with nature and outdoor stays can improve health, especially for older adults and care workers. However, statistics from the Swedish National Board of Health and Welfare, 2024, reveal that 80% of the Swedish residential care facilities (RCFs) lack supportive conditions for movement to and within outdoor environments, and 92% of operators lack routines for outdoor interventions. The overall aim of this thesis is to increase knowledge concerning needs and wishes of older adults and care workers in contact with the outdoor environments at Swedish RCFs and the access to these environments at a national level.

Methods: Study I is based on individual walking interviews with twelve older adults from three RCFs to explore their needs and wishes regarding outdoor environments. In Study II, focus group walking interviews with eleven care workers at the same three RCFs as in study I, were used to explore their reflections on using outdoor environments for person-centred care and rehabilitation. Study III developed a matrix and manual to map access to outdoor environments, and in Study IV, the matrix and manual were used to map the access across all Swedish RCFs, approximately 2,000.

Results: The older adults expressed needs and wishes for outdoor environments at RCFs to be a part of their everyday lives. Care workers saw the potential of these environments as arenas for person-centred care and rehabilitation. A matrix, which included 26 variables, and a manual were developed to map access to outdoor environments. The national mapping revealed limited access to outdoor environments, such as balconies, patios, own gardens, and squares. Furthermore, lack of, and variations in, access were found to be related to geographic location, growing zones, and differences between public and private operators.

Conclusion: Both older adults and care workers acknowledge the value of using outdoor environments as everyday environments and arenas for person-centred care and rehabilitation, recognizing their positive impact on health. However, at national level, access to these environments is limited. The results can be used as support in improving public health among Sweden's oldest population and care workers at RCFs.

Keywords: access, care worker, health-promoting, multi-methods, need, older adult, outdoor environment, person-centred care and rehabilitation, residential care facility

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SAMMANFATTNING PÅ SVENSKA

Introduktion: Titeln på avhandlingen är *Utemiljöer vid särskilda boenden: Behov, önskemål och tillgång för äldre personer och personal.* Det har noterats i forskningsstudier att positiva hälsofördelar kan uppnås via naturkontakt och utevistelse i allmänhet och i synnerhet för äldre personer med nedsatt hälsa. Merparten av de äldre personerna som bor på särskilda boenden har fysiska och/eller kognitiva funktionsnedsättningar som påverkar deras hälsa och möjlighet till självständiga förflyttningar mellan inne- och utemiljö och i utemiljö negativt. Aktuell statistik från Socialstyrelsens brukarundersökning respektive enhetsundersökning för 2024 gör gällande att 35% av de äldre personerna som bor på de svenska särskilda boendena upplever att det inte är trevligt eller endast delvis trevligt i utemiljöerna och 43% att möjligheterna att ta sig utomhus varken är bra eller dåliga eller ganska dåliga/mycket dåliga. Dessutom, enligt chefernas bedömningar saknas det vid ca 60% av de särskilda boendena grundläggande förutsättningar för att utemiljöerna ska vara tillgängliga, ca 80% saknar stödjande förutsättningar för förflyttningar till och i utemiljöerna, 60% saknar förutsättningar för utevistelse i utemiljöerna och 92% av verksamheterna vid boendena saknar en rutin för genomförande av vård, omsorg och rehabilitering i utemiljöerna. En anledning till den dystra statistiken kan vara att det i nuläget saknas en nationell riktlinje för tillgång till utemiljöer vid RCFs. En annan anledning är kunskapsbrist inom person-miljöinteraktionen gällande vilka behov och önskemål de äldre personerna har i kontakten med utemiljöerna samt personalens reflektioner kring att använda utemiljöerna som arenor för personcentrerad vård, omsorg och rehabilitering. Ytterligare kunskapsbrist finns gällande tillgång till utemiljöer vid de 2 036 svenska särskilda boenden på nationell nivå i kombination med avsaknaden av en metod som kartlägger sådan tillgång.

Syfte: Det övergripande syftet med den här avhandlingen var att öka kunskapen om behov och önskemål hos äldre personer och personal i kontakten med utemiljöer vid svenska särskilda boenden samt kunskapen om tillgången till dessa miljöer på nationell nivå.

Material och metoder: Avhandlingen omfattar fyra studier, vilka befinner sig i skärningspunkten mellan disciplinerna vårdvetenskap, arkitektur och landskapsarkitektur/miljöpsykologi. Avhandlingen inkluderar både kvalitativa och kvantitativa metoder. Studie I genomfördes via individuella gåturintervjuer med tolv äldre personer på tre särskilda boenden för att undersöka deras behov och önskemål i kontakten med utemiljöerna. I studie II genomfördes gåturintervjuer som fokusgrupper med elva personal på samma tre boenden för att undersöka deras reflektioner kring att använda utemiljöerna som arenor för vård, omsorg och rehabilitering. Studie III

fokuserade på att utveckla en matris och manual för att kartlägga tillgång till miljöaspekter i kontakten med utemiljöerna. Avslutningsvis, i studie IV användes matrisen och manualen för att kartlägga tillgången till utemiljöer vid svenska särskilda boenden på nationell nivå.

Resultat: De äldre personerna uttryckte behov och önskemål om att utemiljöerna ska vara en del av deras vardagsliv. De äldre personerna bidrog också med insikter om att komma ut i praktiken. Personalen såg potentialen i att använda utemiljöerna som arenor för personcentrerad vård, omsorg och rehabilitering och lyfte fram hur naturkontakt och utevistelse hade en positiv inverkan på hälsa. De såg även utemiljöernas potential för ett berikat vardagsliv och reflekterade samtidigt över utmaningar som fanns för verksamhetsutveckling. Utvecklingen av matrisen för att kartlägga tillgången till utemiljöer omfattade 26 variabler samt en manual. Den nationella kartläggningen visade att tillgången till fönster (som möjliggjorde utsikt och dagsljus in i byggnaderna) var högre i de äldre personernas rum jämfört med de för personal (<98,5% respektive <72,6%). Resultaten visade också att 62,3% av de särskilda boendena hade låg tillgång till balkonger, uteplatser och uterum för äldre personer, medan 82,5% av boendena saknade sådan tillgång för personal. Även tillgången till egna trädgårdar var låg där endast ungefär hälften av de särskilda boendena (54,4%) hade sådan tillgång. Tillgången till omgivningarna, så som offentliga öppna ytor och ytor med hög vegetation inom 300 meters radie från boendena var hög (95,8% respektive 96,6%), medan tillgången till torg var låg (13,3%). Vidare visade resultaten på variation avseende tillgång till utemiljöer baserat på växtzoner och geografiskt läge samt mellan offentliga och privata aktörer.

Konklusion: Denna avhandling bidrar med kunskap om utemiljöer för äldre personer och personal vid särskilda boenden. Specifikt bidrar avhandlingen med kunskap om hur äldre vuxna kan få sina grundläggande mänskliga behov av kontakt med natur och utevistelse tillgodosedda och hur personal och förvaltare praktiskt kan utveckla utemiljöerna som arenor för personcentrerad vård, omsorg och rehabilitering. Vidare framhåller avhandlingen att tillgången till utemiljöer är låg och varierar, särskilt vad gäller tillgången till balkonger, uteplatser, uterum och trädgårdar på nationell nivå, vilket kräver åtgärder från beslutsfattare och myndigheter. Resultaten kan användas som stöd för att förbättra folkhälsan bland Sveriges äldsta befolkning och personal vid särskilda boenden då det framträtt i studierna att utemiljöerna är en underutnyttjad hälsofrämjande resurs, har potential att fungera som betydelsefulla boendemiljöer i åldersvänliga städer och samhällen och har potential som arbetsmiljö för personcentrerad vård, omsorg och rehabilitering. Resultaten från denna avhandling bidrar med implikationer för både teori och praktik. Dessutom bedöms både metoderna och resultaten vara tillämpliga i länder som liknar Sverige och i andra vårdsammanhang.

Nyckelord: behov, hälsofrämjande, multi-metoder, personal, personcentrerad vård, omsorg och rehabilitering, särskilda boenden, tillgång, utemiljö, äldre person

LIST OF SCIENTIFIC PAPERS

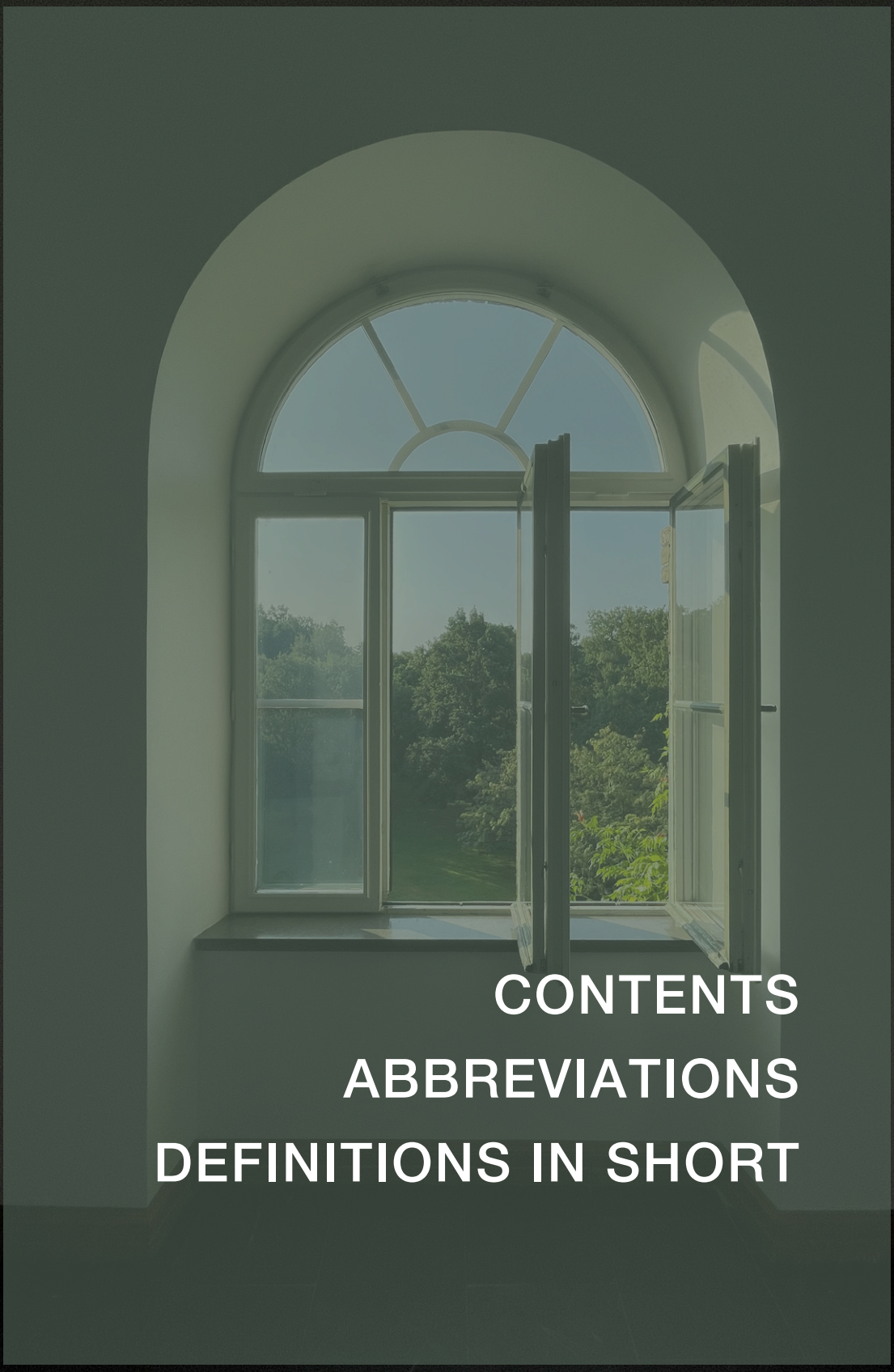
This thesis is based on the following four studies, referred to in the text by their Roman numerals.

I. **Liljegren, M.**, Bengtsson, A., Lindahl, G. & Wijk, H. (2024). Older adults' needs and wishes for contact with the outdoors at residential care facilities: Implications for theory and practice. *Health Environments Research & Design Journal*, *17*(4), 132-149. https://doi.org/10.1177/19375867241276296

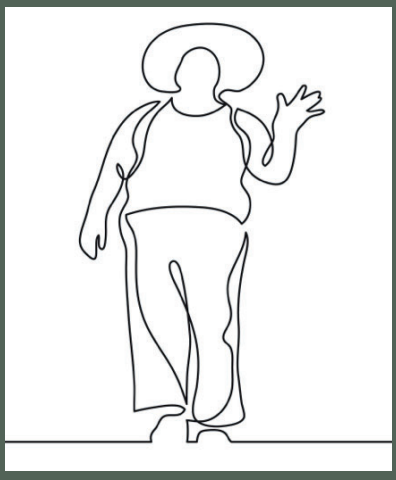
II. **Liljegren, M.**, Bengtsson, A., Lindahl, G. & Wijk, H. (2024). Introducing the outdoor environment as an arena for person-centered care and rehabilitation at residential care facilities for older adults—a care worker's perspective. *Journal of Aging and Environment*, 1–17. https://doi.org/10.1080/26892618.2024.2422411

III. **Liljegren, M.**, Bengtsson, A., Lindahl, G. & Wijk, H. Developing a matrix and manual for mapping access to outdoor environments for older adults and care workers at residential care facilities. Submitted to journal.

IV. **Liljegren, M.**, Bengtsson, A., Lindahl, G. & Wijk, H. Lack of access to outdoor environments as part of everyday life at residential care facilities. Submitted to journal.



CONTENTS
ABBREVIATIONS
DEFINITIONS IN SHORT



CONTENTS

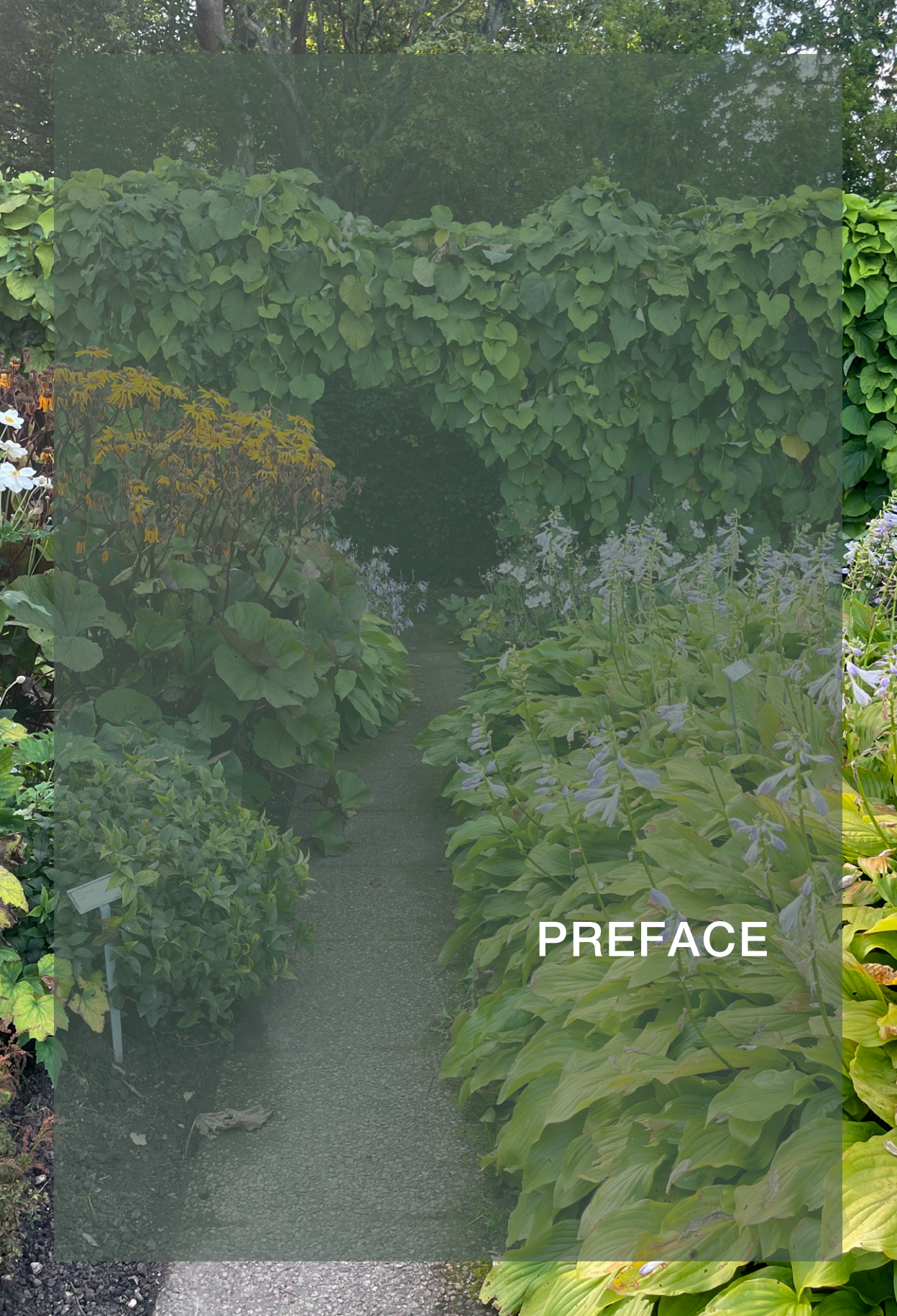
ABBREVIATIONS

BPSD	Behavioral and Psychological Symptoms of Dementia
COREQ	COnsolidated criteria for REporting Qualitative research
EBD	Evidence-Based Design
EBP	Evidence-Based Practice
QET	Quality Evaluation Tool
RCFs	Residential Care Facilities
SOS Tool	Seniors' Outdoor Survey
SPORE	Staff Perceptions Of Residential care facility Environments
SPSS	Statistical Package for the Social Sciences
Sq m	Square meter
S-SCEAM	Swedish version of the Sheffield Care Environment Assessment Matrix
WHO	World Health Organization

DEFINITIONS IN SHORT

Architecture science	A bridge between design theory and construction practice.
Care	Interventions for persons regarding social services, support and services for persons with disabilities, and healthcare in accordance with applicable laws (The Swedish National Board of Health and Welfare, 2007).
Care worker	Social care worker and healthcare worker
Contact with nature/outdoors	Range from visual contact, to being in nature, to active involvement with nature (Ekkel & de Vries, 2017).
Environmental psychology (science)	Interaction between people and the space they live in.
Gerontology	Study of aging and older adults.
Growing zone	Sweden comprises eight growing zones that specify cultivation conditions and thus indicate the outdoor climate conditions. Growing zone I is found in the mildest climate of the country and zone VIII in the harshest.
Health	A state of physical, mental, and social well-being, not merely the absence of disease or infirmity (World Health Organization, 1948).
Healthcare environment research	Focus on the importance of environments for health and well-being.
Healthcare science	Promotion of good health and the person's experiences in connection with ill health, illness and suffering.

Healthcare worker	Nurses, occupational therapists, and physiotherapists who provide healthcare support to older adults.
Health-promotion	The process of enabling people to increase control over and improve their own health (World Health Organization, 1986).
Landscape architecture science	Develops knowledge to support landscape architects in their design of landscapes and in maintaining the value of these.
Older adult	Women/men 65 years old or older with or without declining health.
Outdoor environment	Physical environments such as balcony, patio, conservatory, garden as well as the surroundings.
Person-centred care and rehabilitation	A practical, ethical, and holistic approach based on a person's right to influence decisions impacting their health and well-being.
Rehabilitation	Interventions that will contribute to a person with an acquired disability, based on their needs and conditions, regaining or maintaining the best possible functional ability and creating good conditions for an independent life and active participation in community life (The Swedish National Board of Health and Welfare, 2007).
Residential care facility	Adapted housing for older adults who need round-the-clock support of care workers and the physical environment.
Social care worker	Assistant nurses and activity leaders who provide social support to older adults.
Swedish counties	Sweden's 290 municipalities are divided into 21 counties.
Swedish municipal group classification	Sweden's 290 municipalities are sorted under three municipal group classifications based on population size and population density.



PREFACE

PREFACE

In my work as a physiotherapist at Swedish municipal healthcare RCFs for older adults, I became interested in person-environment interactions. I noticed that the older adults were rarely outdoors, which made me wonder whether they lacked a need for contact with nature or whether there were other barriers preventing outdoor stays. Parallel to these reflections, I had my own experience of daily outdoor stays having a positive impact on health and well-being. Could it be that it was too difficult for the older adults to move between the indoors and the outdoors? Or, perhaps, there were no outdoor environments available, or there was a sense of insecurity with the outdoors since care workers primarily worked indoors? These observations and questions formed my pre-understanding which culminated in a master's thesis grounded in landscape architecture/environmental psychology titled: 'The outdoor environment such as healthcare environment: How outdoor environment at nursing and care homes for people with dementia can be an asset to promote physical activity and fall prevention'. Yet, and despite the master's thesis, several questions remained unanswered and new ones emerged.

This curiosity led me to this interdisciplinary OUT-FIT project, which is the first Swedish double-degree doctoral project encompassing healthcare science and architecture. The project and this thesis address a societal challenge by focusing on outdoor environments for older adults and care workers at RCFs. It lies at the intersection of the disciplines of healthcare science (represented by the University of Gothenburg, Gothenburg), architecture (represented by Chalmers University of Technology, Gothenburg), and landscape architecture/environmental psychology (represented by the Swedish University of Agricultural Sciences, Alnarp). In this thesis, landscape architecture/environmental psychology is presented together, given that my master's degree was in landscape architecture/environmental psychology. To provide a broader context, it is worth noting that all three disciplines are relatively young as research fields. For example, in Sweden, research on healthcare environments as well as within landscape architecture/environmental psychology began to develop in the 1990s.

The four studies that form this thesis were conducted by the research group I belong to, which, in addition to myself, included my supervisors Helle Wijk (registered nurse, professor at the University of Gothenburg, and guest professor at Chalmers University of Technology), Göran Lindahl (architect and professor at Chalmers University of Technology), and Anna Bengtsson (landscape architect and senior lecturer at the Swedish University of Agricultural Sciences). In one of the studies, research assistants Kateryna Fursa (University of Gothenburg) and Anna Åshage (Swedish University of

Agricultural Sciences) were also involved. The collaboration has worked well, providing an important platform for my learning and development as a PhD student.

Throughout the research, I visited several RCFs and had the privilege to take part in older adults' life stories. Some left a particularly strong impression. I specifically recall one wheelchair-bound woman who mentioned, during our outdoor walking interview, that this was the first time she visited the garden at the RCFs. She was really fascinated, but at the same time worried about her dependence on others to get outdoors. I also spoke to healthcare workers who generously shared their reflections about their work situation.

The work on this thesis has brought moments of smiles, for example, when I reflected that within a span of 300 years at least two national Swedish scientific mapping studies have focused on nature and the outdoors. The first was conducted in the early 18th century by Carl von Linné, the professor, botanist, and physician who developed a hierarchical system for classifying nature, a system that is still internationally accepted. In one of the studies included in this thesis, a national mapping study was also carried out—this time focused on access to outdoor environments at RCFs. However, the methods of data collection differ greatly. Carl von Linné gathered his data through scientific expeditions, while my research colleagues and I have digitally 'walked in Sweden', using drawings and open-access online map services.

Finally, to inspire outdoor environments for older adults and care workers in the Swedish context, this thesis includes a selection of photos. These photos showcase a variety of environments, from urban spaces to natural landscapes. Originally, the plan was to use photos to highlight the older adults and care workers; however, due to the absence of relevant photos from the Swedish RCFs context in image banks, I have instead opted to represent them through schematic drawings.

Enjoy the reading, photos, and drawings!

Höllviken, April 2025

Madeleine Liljegren

INTRODUCTION

INTRODUCTION

This chapter introduces the thesis by first providing an overview of the life situation of older adults. It begins with a description of aging and general characteristics of older adults living at Swedish RCFs. Next, the conditions faced by social and healthcare workers in the RCFs are outlined. The chapter also explores the health benefits of contact with nature, outdoor stays, and outdoor work, as well as outdoor environments for health and well-being. Furthermore, evidence-based practices and design principles to enhance understanding of decision-making processes for care and rehabilitation as well as for the design of outdoor environments are highlighted. Finally, the rational for the thesis is presented followed by the aim.

AGING

Aging is a natural, complex, and individual process involving biological, psychological, and social factors. Biological aging refers to irreversible changes in cells and body systems, affecting physical health, social activity, and perceptions of the environment. Psychological aging involves mental adaptation to aging, which can lead to either constructive coping or dependence on others. Social aging reflects an older adult's role in society, influenced by cultural norms and societal attitudes towards aging (Dziechciaż & Filip, 2014). Furthermore, chronological aging also exists, which marks the time passed since birth (Hamczyk et al., 2020).

Definitions of 'older adults' differ globally, with Sweden typically considering someone being older at 65 years (The Swedish National Board of Health and Welfare, 2023a). Advanced age increases the risk of chronic diseases, multimorbidity, and polypharmacy (Hsu et al., 2021), complicating daily activities and reducing independence (Chatterji et al., 2015), which can lead to isolation and a sense of being 'homeless in life' (Hemberg et al., 2019). When everyday life becomes too challenging in ordinary housing, moving to RCFs may become relevant (The Swedish National Board of Health and Welfare, 2011). Older adults at RCFs, particularly those with physical and/or cognitive disabilities, often struggle with indoor and outdoor mobility (Narsakka et al., 2022). Due to such disabilities, a conscious design is required to promote well-being (Nordin, 2016). Limited outdoor mobility is common, especially for those using mobility aids (Clarke, 2014). Barriers such as lack of convenience facilities outdoors, lack of easy access, or understaffing can also hinder mobility and autonomy (Bengtsson, 2015; Kane, 2013; Van Loon et al., 2021).

OLDER ADULTS AT SWEDISH RCFS

In Sweden, the 4 § of the Social Services Act (2001:453) mandates that the municipalities shall strive to ensure that older adults are provided the opportunity to live independently under safe conditions and have an active and meaningful life in community with others. The 5 § of the Social Services Act (2001:453) further mandates that municipalities shall strive to ensure that older adults have good housing and, in addition, that they provide those who need it with support and assistance at home as well as with other easily accessible services. They shall also offer special housing for service and care for older adults who need special support (The Swedish Government, 2001). Swedish RCFs are categorized as special housing.

Around 88,000 older adults live at the approximately 2,000 Swedish RCFs (The Swedish National Board of Health and Welfare, 2022). These facilities offer round-the-clock personal support to older adults aged 65 years and older with physical and/or cognitive disabilities. Among older adults aged 65–79, about 1.5% of Sweden's population live at RCFs, while for those over 80, the percentage rises to about 14% (The Swedish National Board of Housing Building and Planning, 2024). The average age at admission to RCFs is 86.2 years, with an average length of stay of 2.3 years (The Swedish National Board of Health and Welfare, 2024a), and women are overrepresented (The Swedish Council for the Promotion of Municipal Analysis, 2023). The physical environments of RCFs play a key role in the support of older adults, offering private apartments adapted to their needs and common spaces for socialization (Nordin, 2016). In Sweden, about 80% of the RCFs are run by municipalities (public); the rest are run by private operators (Broms et al., 2024).

CARE WORKERS

At Swedish RCFs, a range of professionals, such as social care workers (assistant nurses, and activity leaders) and healthcare workers (nurses, occupational therapists, and physiotherapists) provide care and rehabilitation (The Swedish Association of Local Authorities and Regions, 2023a). They provide interventions such as meals, dressing, hygiene, wound care dressing, medication management, rehabilitation, prescription of mobility aids, and activities (The Swedish National Board of Health and Welfare, 2023b). Care workers have reported that caregiving to older adults is meaningful to them (Vidman & Strömberg, 2018).

Among Swedish assistant nurses in elderly care, there is significant diversity, with more than 40% having been born outside of Sweden (The Swedish National Board of Health and Welfare, 2025). The diversity among healthcare workers is unknown. A common challenge for social care workers and healthcare workers at the same RCFs is that they can belong to different organizations and thus have different managers. Another distinction is that social care workers are governed by the Social Services Act (The Swedish Government, 2001), while healthcare workers are regulated under the Health and Medical Services Act (The Swedish Government, 2017).

RISK AND HEALTH FACTORS

Care workers in Sweden have high illness absence rates, and recruiting and retaining them is problematic (The Swedish National Board of Health and Welfare, 2025; The Swedish Social Insurance Agency, 2022, 2023). To improve the situation, creating attractive work environments is crucial for recruitment, retention, and job satisfaction (Choi et al., 2012). Previous research on health-promoting workplaces in healthcare has primarily focused on risk factors. Despite this, challenges such as stress, high workload, insufficient competence, ethical stress and high illness absence rates remain widespread (Lövenmark & Hammar, 2024; Svartengren et al., 2013; The Swedish Agency for Work Environment Expertise, 2023; The Swedish Institute of Stress Medicine, 2021). The high illness absence rates, underscores that to focus solely on risks is insufficient. Thus, there is a need to develop health-promoting work environments and working methods. Currently, there is knowledge about important organizational health factors, such as job security, opportunities for employees to influence how their working hours are allocated, and the degree of autonomy they have at both individual and group levels. Other important health factors include fostering equal cooperation within work teams, as well as providing work environments that meet care workers' needs for natural daylight and access to appropriate assistive aids. Proactively addressing these health factors could mitigate the challenges (Svartengren et al., 2013; The Swedish Agency for Work Environment Expertise, 2023; The Swedish Institute of Stress Medicine, 2021).

HEALTH EFFECTS OF CONTACT WITH NATURE, OUTDOOR STAYS, AND OUTDOOR WORK

Using outdoor environments for health promotion in care and rehabilitation has historical roots (Dushkova & Ignatieva, 2020; Korsgaard, 1989; McCauley & Hayes, 2021), and the therapeutic role of nature for older adults is well-documented (Verderber et al., 2023). For example, health-promoting effects of contact with nature already begin inside a building with views through the windows. In healthcare settings, these views positively impact recovery and reduce the use of painkillers (Ulrich, 1984). Furthermore, seeing trees fosters a sense of togetherness when human contact is unavailable (Alerby & Engström, 2021). Specifically for older adults at RCFs, nature views can improve quality of life and protect against stress (Sugiyama et al., 2022) as well as contribute to a sense of connection with the surroundings for those with limited mobility (Musselwhite, 2018). Access to windows allows daylight to enter the building, which also has a positive effect on health (Aries et al., 2015).

The health benefits to older adults of outdoor stays or engaging in garden therapy are well-documented and include reductions in agitation, depression, medication use, stress (Murroni et al., 2021), and fall risk (Wolf et al., 2015). Outdoor stays promote higher levels of physical activity compared with indoor settings (Tenngart Ivarsson & Grahn, 2012) and help counteract negative effects of inactivity (Cunningham et al., 2020), such as prolonged sitting (Douma et al., 2017). For older adults with cognitive

decline, a secure and adaptable outdoor environment offers opportunities for independent movement (Odzakovic et al., 2020). Ample greenery in gardens seems to promote experiences of fascination and 'being away' based on attention restoration theory by Kaplan and Kaplan (1989), encouraging more frequent outdoor stays (Dahlkvist et al., 2016). The greatest health effects of outdoor stays are evident in the most frail and vulnerable older adults (Ottosson & Grahn, 1998, 2005, 2013).

Access to nature views is also beneficial to care workers, contributing to fewer medication errors (Zadeh et al., 2014) and improving both work ability and job satisfaction (Lottrup et al., 2015). Having access to views and natural light in the workplace is considered to be of such important for employees' health that it is regulated. Conversely, lack of such access can disrupt circadian rhythms and lead to impaired sleep and mood (The Swedish Work Environment Authority, 2019). Daily use of gardens improves care workers' communication and relationships with older adults with dementia, while also promoting relaxation (van der Velde-van Buuringen et al., 2021). When the workplaces moves outdoors, office workers experience improved well-being, improved recovery, greater autonomy, and better communication and social relations (Petersson Troije et al., 2021). Access to gardens during breaks is also linked to a lower risk of stress-related sick leave in nurses (Cordoza et al., 2018). Therefore, one potential approach is to use the outdoor environments at RCFs for work in terms of care and rehabilitation of older adults as well as for relevant administrative work. However, outdoor stays and outdoor work should not be viewed solely in a positive light. Negative aspects such as cold, heat, darkness, slippery pathways, and pollen also exist, which can pose risks and cause discomfort (Engström et al., 2022).

TIME RECOMMENDATION FOR OUTDOOR STAYS

There is variation in the amount of time older adults spend outdoors, both at the individual level and RCFs level (Artmann et al., 2017; Dahlkvist et al., 2019). To define the amount of outdoor time needed to attain positive health benefits, researchers from several countries have collaborated to develop a time recommendation (White et al., 2019). The recommendation is that everyone, including older adults and care workers at RCFs, should spend at least two hours per week outdoors. Another study specifically focused on older adults with dementia at RCFs, reports benefits from at least 30 minutes of daily outdoor stays (van der Velde-van Buuringen et al., 2021). Lack of outdoor stays have been shown to have negative consequences in older adults at RCFs, such as feelings of disappointment and reduced well-being (Dahlkvist et al., 2019).

CONDITIONS FOR OUTDOOR STAYS

A European study involving 126 RCFs across 17 cities in Norway, Germany, Austria, Slovenia, Romania, and Poland found that 64% of the RCFs used outdoor environments for therapeutic purposes (Artmann et al., 2017). Experiences of outdoor environments at Swedish RCFs are reported in the Swedish National Board of Health

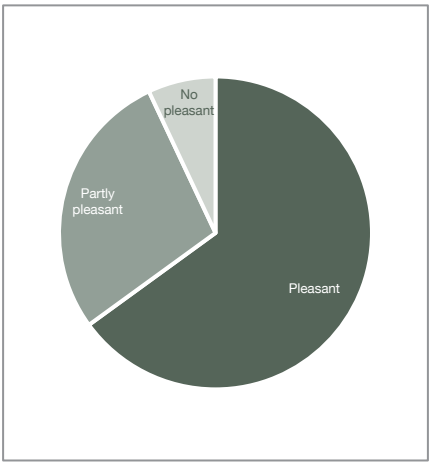


Figure 1. Older adults' experiences of the outdoor environments at Swedish RCFs (n=32,414, response rate: 44%). Illustration: M. Liljegren

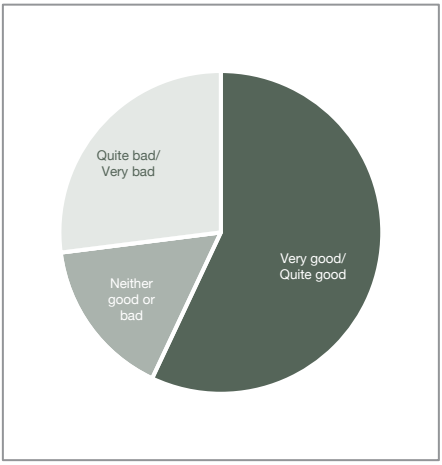


Figure 2. Older adults' experiences of the opportunities to go outdoors at Swedish RCFs (n=32,414, response rate: 44%). Illustration: M. Liljegren

and Welfare's two annual national surveys. One covered the older adults' experiences and the other the managers' assessments. According to the older adults, 35% experience that it is unpleasant or partly pleasant in the outdoor environments, and 43% that the opportunities to go outdoors are neither good nor bad or quite bad/very bad (The Swedish National Board of Health and Welfare, 2024b) (Figures 1 and 2).

In addition, according to the RCFs managers', approximately 60% of the Swedish RCFs lack basic conditions for outdoor environments to be accessible, approximately 80% lack supportive conditions for movement to and in the outdoor environments, 60% lack conditions for outdoor stays in outdoor environments, and 92% of the operators at these RCFs lack routines for interventions outdoors. The managers' assessments indicate that RCFs operated by private organizations generally offer better conditions concerning outdoor environments and outdoor stays than do those run by municipal operators (Figure 3) (The Swedish National Board of Health and Welfare, 2024c). A possible explanation for the dismal statistics may be that older adults at Swedish RCFs do not have the same legal right to daily outdoor stays (Nilsson Hörnell, 2021) as do persons under criminal justice sentence (The Swedish Government, 2010a). Another possible explanation could be lack of knowledge regarding the needs and wishes of older adults in contact with outdoor environments.

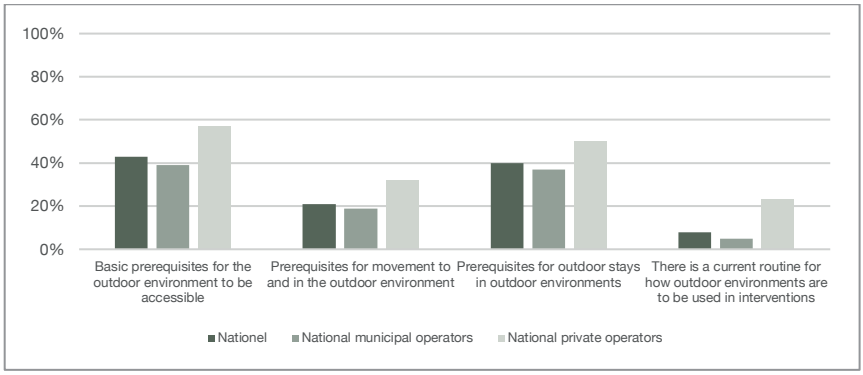


Figure 3. Older adults' conditions for access to outdoor environments and outdoor stays at Swedish RCFs (n=1,914, response rate: 89%). Illustration: M. Liljegren

OUTDOOR ENVIRONMENTS FOR HEALTH AND WELL-BEING

There is continuous interaction between person and environment, which impacts the health and well-being of older adults and care workers at RCFs (Joseph et al., 2016). The environments that older adults and care workers at RCFs interact with range from indoor environments to the surroundings (Bengtsson, 2015). People perceive the physical environment based on the opportunities for actions and experiences it offers (Gibson, 1979). These opportunities, known as affordances, are situation-dependent relationships shaped by individual needs, social factors, and physical environmental conditions. Extensive research has been conducted to explore what experiential values in outdoor environments are important to support health and well-being, and what are the fundamental needs for interactions with outdoor environments. This research has identified eight sensory dimensions (Grahn et al., 2010; Stoltz & Grahn, 2021) which encompass and are shaped by all the senses and the body (often in motion) as well as by emotions and cognitive abilities. Therefore, they are not strictly defined in terms of specific physical attributes but are considered perceived qualities that emerge in interactions between people and outdoor environments. The eight sensory dimensions are: natural, cultural, cohesive, diverse, shelter, open, serene, and social. Ideally, a supportive outdoor environment should include all eight dimensions, distributed across different areas of the outdoor environment.

AGE-FRIENDLY CITIES AND COMMUNITIES

To foster inclusion of older adults into society, the World Health Organization (WHO) has placed the development of age-friendly cities and communities on the international (World Health Organization, 2024), Nordic (Nordic Welfare Centre, 2024), and Swedish agendas (The Swedish Association of Local Authorities and Regions, 2022). An age-friendly city or community is one that promotes health and is designed to embrace diversity and cohesion across generations. Age-friendly cities and

communities enable older adults to remain active, stay connected, and contribute to the social, cultural, and economic life of society. They also ensure that the design of the physical environment is supportive, which includes barrier-free access to buildings and walkways, availability of public seating (World Health Organization, 2024), and access to pleasant, clean outdoor spaces with green areas (World Health Organization, 2023a). Ensuring older adults' access to outdoor environments is a priority in the United Nations Sustainability Development Goal 11:7 (United Nations, 2022). To support the development of age-friendly cities and communities, the WHO has created a practical guide, including an implementation framework, which can be a valuable resources (World Health Organization, 2023b). Furthermore, research has shown that older adults at RCFs can actively participate in the co-creation of age-friendly cities and communities (de Boer et al., 2021), highlighting the importance of including them in the planning processes of environments.

HEALTH-PROMOTING ENVIRONMENTS AT RCFS

Health promotion is the process of empowering persons to gain greater control over their health and improve their well-being (World Health Organization, 1986). Previous research supports the relevance of the built environment for health promotion (Perdue et al., 2003) and has linked health promotion to urban design (Barton et al., 2021) and building design (McGann et al., 2014). One of the goals of health promotion is to create supportive environments as health is shaped where persons live and work (World Health Organization, 1986, 1991a). These environments, which include the built, natural, and social environments, should foster health resources at both the individual level as well as on population level (World Health Organization, 1991b).

The environments at RCFs are complex because they are both living environments for older adults (Nordin, 2016) and work environments for care workers (Rechel et al., 2009). For older adults and care workers to reap the health benefits of contact with nature, outdoor stays, and outdoor work, access to specific physical environmental aspects is essential. This includes windows for views, doors for easy movement between indoors and outdoors, and accessible outdoor environments such as balconies, patios, conservatories, gardens, parks, and squares (Bengtsson, 2015; Bengtsson & Lavesson, 2024). Other aspects, such as the size of green spaces and its qualities, are also of importance. For example, outdoor stays are facilitated by short distances (fewer transition points) between the older adults' apartments and the outdoor environments (Ekkel & de Vries, 2017; van den Berg et al., 2020).

To increase understanding of the connection between physical environmental aspects at RCFs and health and well-being, a few examples are provided. For example, access to weather-protected outdoor environments, such as greenhouses, glazed balconies, and conservatories, offers benefits to both older adults and care workers by extending the outdoor season. These environments provide warmth, dryness, and protection from wind and rain, while enabling outdoor stays (Detweiler et al., 2012; Gonzalez & Kirkevold, 2016; Hernandez, 2013). Additionally, having access to own gardens has been shown to be beneficial (Artmann et al., 2017), as well as proximity to public green

spaces within 300 meters of RCFs which improves physical, mental, and social well-being (Konijnendijk, 2023; Nieuwenhuijsen et al., 2022).

RECOMMENDATION OF ACCESS TO OUTDOOR ENVIRONMENTS

In Sweden, there is a national recommendation concerning access to outdoor environments for children in preschools and in schools, aimed to ensure sufficient space for play and outdoor stays (The Swedish National Board of Housing Building and Planning, 2021). The recommendation suggests that an appropriate measurement of outdoor space is 40 sq m per child in preschools and 30 sq m per child in schools. A similar recommendation to ensure outdoor space at RCFs is currently lacking. The need for such a recommendation is supported by research that highlights the importance of key benchmarks, the absence of which often leads to outdoor environments being overlooked in community planning (Nilsen & Hägerhäll, 2012).

EVIDENCE-BASED APPROACHES

Adopting an evidence-based approach means using the best available research and practical knowledge to optimize decision-making. However, it is important to be aware that extensive research is not always available, which can pose challenges for decision-making and must be addressed. In this thesis, two perspectives related to the term evidence are particularly relevant: evidence-based practice (EBP) which guides care workers in decisions about care and rehabilitation (Pistone et al., 2022), and evidence-based design (EBD) which addresses how architects and landscape architects make decisions regarding the design of physical environments (Hamilton & Watkins, 2009).

EVIDENCE-BASED PRACTICE

For care and rehabilitation to be of high quality, it is essential that the person's needs and wishes are met based on current evidence from interventions and care workers' experience, in accordance with the Patient Safety Act which applies to all healthcare professionals (The Swedish Government, 2010b). Collaboration between the person receiving care and rehabilitation and the care worker is an additional crucial aspect for good care and rehabilitation. The significance of EBP is that professional decisions are based on a combination of: (1) the person's situation and contextual circumstances, (2) the person's experiences and preferences, and (3) the best available knowledge. Together, these aspects lead to: (4) professional expertise in decision-making (The Swedish National Board of Health and Welfare, 2020). The decisions made are documented by the care workers in the person's care and/or rehabilitation plan.

A common feature of both care and rehabilitation plans is that they include a process for assessment, planning, implementation, and evaluation of interventions. For example, Swedish nurses use the nursing process (Swedish Nursing Association, 2024); occupational therapists follow the occupational therapy process (Fischer & Nyman, 2011); and physiotherapists apply the physiotherapy process (The Swedish Association of Physiotherapists, 2019). These processes are characterized by ethical

and critical reasoning, grounded in specific knowledge and reflection, which serve as the foundation for delivering person-centred care and rehabilitation. After interventions are evaluated, new decisions can be made regarding the need for additional actions, thus restarting the process. A condition for high quality care and rehabilitation is access to appropriate physical environments in which these interventions take place (McCormack et al., 2021).

The Swedish Health and Medical Services Act, which outlines overarching goals and guidelines for measures to prevent, investigate, and treat diseases and injuries (The Swedish Government, 2017), currently lacks provisions regarding the physical environments in which these services are provided. As a result, there are no recommendations that promote a specific environment as the standard nor prohibits its use. The absence of clarity regarding indoor and outdoor environments as healthcare environments may contribute to uncertainty about what environments are appropriate for care and rehabilitation.

Furthermore, part of the EBP involves care workers collaborating on the health conditions of older adults through national digital quality registers. At the RCF level, these registers serve as tools to support prevention efforts for older adults at risk of falls, pressure ulcers, malnutrition, oral health issues, or those experiencing bladder dysfunction or behavioural and psychological symptoms related to dementia. At the national level, the quality registers provide a valuable data source that can be used for evaluation, improvement efforts, and research on older adults. The majority of Swedish municipalities/RCFs are connected to the most commonly used registers for older adults at RCFs, such as the Senior alert, the BPSD (Behavioural and Psychological Symptoms of Dementia) register, and the National prescribed drug register (Senior alert, 2024; The Swedish BPSD register, 2025; The Swedish National Board of Health and Welfare, 2023c). There is, however, a national need to further develop digital infrastructure within elderly care (Forska!Sverige, 2024). Currently, there are no similar registers that collect information about the care workers' occupational health.

EVIDENCE-BASED DESIGN

When designing buildings and outdoor environments, it can be challenging to determine what physical environmental aspects to include. By basing the planning process on an EBD approach that considers aspects relevant to the health challenge at hand, the likelihood of creating supportive and health-promoting environments for the users is increased (Centre for Healthcare Architecture, 2021). The EBD approach has increasingly been adopted in healthcare-facilities design to strive for integration of research-based aspects that create outcomes satisfying for both patients and care workers, and that improve health and well-being (Centre for Healthcare Architecture, 2021; Stankos & Schwarz, 2007; Ulrich et al., 2008).

Furthermore, EBD is an interdisciplinary approach that integrates evidence from multiple disciplines, such as architecture, landscape architecture, building construction, and healthcare (Bengtsson et al., 2018; Elf et al., 2015; Kasali &

Nersessian, 2015). For example, to support access to health-promoting and green cities, the internationally accepted 3-30-300 rule offers an evidence-based practical guideline (Browning et al., 2024; Konijnendijk, 2023). This rule advocates that persons should be able to see at least three trees from their home or workplace windows, live in neighbourhoods with 30% tree canopy cover, and be within 300 meters of green spaces. To support the design of health-promoting Nordic cities, a handbook is available (Nordregio, 2024); for the design of outdoor environments in Swedish healthcare settings, a research compilation is available (Bengtsson et al., 2018). A key aspect of EBD is to begin by identifying the needs and wishes of the users (Hamilton & Watkins, 2009), such as older adults and care workers at RCFs.

In the context of older adults, care workers, and RCFs, there are four quantitative and one qualitative evidence-based tool that are particularly relevant for designing high-quality indoor and outdoor environments. These tools are evidence-based as they are grounded in previous research and published scientific journals, ensuring high-quality research. The tools are:

- Quantitative tools:
    - Housing Enabler: focuses on housing accessibility and environmental barriers for senior citizens and persons with disabilities (Iwarsson et al., 2012).
    - The Staff Perceptions Of Residential Care Facility Environments (SPORE): focuses on assessing and designing indoor environments at RCFs to improve care workers' work satisfaction and contribute to their ability to provide high-quality, person-centred care (Nordin, Elf, et al., 2024).
    - The Swedish version of the Sheffield Care Environment Assessment Matrix (S-SCEAM): evaluates both indoor and outdoor environments at RCFs from the perspective of older adults (Nordin et al., 2015).
    - The Seniors' Outdoor Survey (SOS Tool): focuses on outdoor environments for older adults at RCFs (Bardenhagen et al., 2018; Rodiek et al., 2016).
- Qualitative tool:
    - The Quality Evaluation Tool (QET): focuses on two design concepts tailored for outdoor environments at RCFs, comfortable design and stimulating design (Bengtsson & Grahn, 2014). The QET is closely linked to the eight sensory dimensions (Grahn et al., 2010; Stoltz & Grahn, 2021) as they are part of the stimulating design qualities.

QET is described in detail in the theory chapter as it is used in one of the thesis studies.

RATIONALE OF THE THESIS

The body of knowledge presented in this introduction chapter supports the understanding of person-environment interaction and also highlights current knowledge limitations. It is well recognized that the physical environment, including outdoor environments, has an impact on health and well-being and is significant in the daily life of people in general. Therefore, it is reasonable to assume that the physical environment at RCFs has an impact on health and well-being of older adults as they spend most of their time in these environments due to decreasing health. It is also reasonable to assume that the physical environment has an impact on health and well-being of care workers as they spend most of their working hours in these settings, providing round-the-clock care and rehabilitation to older adults. Previous studies with older adults have shown that supportive physical environments can improve health and well-being whereas hindering environments can have negative effects which increase dependency on personal support. Similarly, research has shown that supportive work environments can enable care workers to perform their tasks with high quality whereas hindering environments can create challenges. The physical environment could thereby be seen as an integrated component of person-centred care and rehabilitation, thus shaping the conditions for both daily life and work life at RCFs.

At present, there is limited knowledge on needs and wishes of older adults in relation to outdoor environments at RCFs. Investigating these needs and wishes is crucial for expanding our understanding of supportive physical environmental aspects that are of importance at RCFs. There is also limited knowledge about how outdoor environments at RCFs can be used as arenas for person-centred care and rehabilitation, confirmed by statistics from the Swedish National Board of Health and Welfare. To provide new insights, it is of importance to gather care workers' reflections on using outdoor environments for person-centred care and rehabilitation as the care workers are the ones providing support to the older adults. Another existing limitation concerns access to outdoor environments at Swedish RCFs, in terms of physical aspects such as windows, entrances, balconies, patios, conservatories, gardens, parks, and squares. Investigating such access is of importance, as these aspects provide the conditions for older adults and care workers to benefit from the possible positive health effects of contact with nature, outdoor stays, and outdoor work. Additionally, access is of importance to be able to offer person-centred care and rehabilitation outdoors. Furthermore, although several evidence-based tools exist for assessing physical environmental aspects, they lack variables that quantitatively map access to outdoor environments at RCFs.

Therefore, this thesis aims to fill the research gaps mentioned above by addressing the four following topics:

- Explore older adults' needs and wishes related to contact with nature and outdoor stays at RCFs.

- Explore the potential of using outdoor environments at RCFs as arenas for person-centred care and rehabilitation from the perspective of care workers.
- Develop a process for mapping access to outdoor environments for older adults and care workers at RCFs.
- Map access to outdoor environments for older adults and care workers at Swedish RCFs on a national level.

AIM

The overall aim of this thesis was to increase knowledge concerning needs and wishes of older adults and care workers in contact with the outdoor environments at Swedish RCFs and the access to these environments at a national level.

By providing this important information, the thesis contributes to a more comprehensive understanding of person-environment interactions within the context of RCFs. Each study (Studies I-IV) in the thesis constitutes a separate paper (Papers I-IV).

Specific research aims of each study:

I. To explore needs and wishes of older adults concerning their perceived need for contact with outdoor environments at RCFs and what implications it has for theory and practice.
II. To explore care workers' reflections on the outdoor environment as an arena for care and rehabilitation.
III. To develop a matrix and manual for quantitative mapping of access to environmental aspects in outdoor environments for older adults and care workers at RCFs.
IV. To map access to outdoor environments for older adults and care workers at Swedish RCFs on a national level.

THEORETICAL PERSPECTIVES

THEORETICAL PERSPECTIVES

This thesis is based on a practical framework, two models, and one evidence-based tool, each grounded in theory and focusing person-environment interaction. Before delving into the theoretical perspectives, the thesis first outlines its ontological and epistemological approach.

ONTOLOGICAL AND EPISTEMOLOGICAL APPROACH

Ontology pertains to the researcher's view of the world (Staab & Studer, 2003). This thesis adopts a holistic humanistic view. This means that older adults and care workers are viewed as reflective and interpretive beings within the world they inhabit. Their reflections and interpretations are subjective and can never be considered absolute truths; these are dependent on context and social setting, in line with the personal philosophy. Moreover, older adults possess free will and are actively involved in decisions regarding their care and rehabilitation (Kristersson Uggla, 2020). Care workers also have a free will in their choice of profession. Furthermore, all four studies are guided by a salutogenic approach, which emphasizes humans' inherent ability to move toward health and well-being (Antonovsky, 1996). This ability reflects a person's capacity to cope with and adapt to life's challenges, which is crucial for promoting long-term health and well-being. This approach is evident in the needs and wishes of older adults and care workers in Studies I and II. It is also evident in the variables selected for Studies III and IV, which focus on health-promoting aspects of the physical environment rather than health-limiting ones.

The selection of theoretical perspectives is based on ontology, that is, my perspective as a researcher. The common thread among these perspectives is the physical environments and persons with reduced physical abilities in a context of care and rehabilitation. The four theoretical perspectives are the person-centred practice framework, the ecological model of aging, the principal model of four zones of contact with the outdoors, and the QET, each detailed below.

Epistemology refers to the researcher's views of knowledge (Niiniluoto et al., 2004) and has guided the study design and methodology. In line with the researcher's view of knowledge, consisting of both people's experiences and reflections, and measurable facts, both subjective data (from interviews, Studies I and II) and objective data (mapping, Studies III and IV) were required.

Furthermore, the methods employed probed experiences of space and place, both of older adults and care workers (Andrews & Phillips, 2004; Roxberg et al., 2020; Ryan et al., 2019). The qualitative design in Studies I and II reflects an interpretive

constructivist tradition (Creswell & Creswell, 2022) where the understanding of needs and wishes in contact with the outdoor environment is in focus and includes multiple participants' meanings. This approach means that the outdoor environment includes not only physical aspects but also the social interactions between persons, materials, and socio-political aspects of RCFs. Hence, spaces are not seen as static but rather as transformative, multifaceted, and shaped by their cultural and historical contexts (Agnew, 2011). From a subjective perspective, the environment is experienced in terms of sensory impressions, experiences, expectations, a sense of welcome, familiarity, and intentions.

In contrast, the quantitative study (Study IV), grounded in a positivist epistemological approach, conceptualizes the outdoor environment as an absolute, fixed, and measurable entity. This perspective situates the outdoor environment within environmental determinism, viewing it as a neutral, objective setting for users, with a focus on defining, quantifying, and analysing. Objective, measurable variables include aspects such as access to different areas, natural light, distances, elevation changes, and colours. The four studies are complementary because the interpretive and constructive perspective mutually increase understanding of the quantitatively measured outcomes regarding the access to and use of outdoor environments. Together, they provide a holistic view of how outdoor environments at RCFs can be experienced and accessible.

PREUNDERSTANDING

My experiences of outdoor environments at RCFs are primarily shaped by my background as a physiotherapist at RCFs for older adults and my master's degree in landscape architecture. Additionally, I have reflected on my experiences to appraise their possible influence on the analyses and interpretations of the results in each study. This was particularly important in the context of the qualitative walking interviews with older adults and care workers as the researcher serves as an instrument in the data collection process (King & Woodroffe, 2019). Consequently, my beliefs and position necessitated a process of active reflection—an ongoing practice of acknowledging how my position may impact the research (Berger, 2015). A critical aspect of this reflective practice included addressing my own preconceptions and maintaining awareness of my former role as a healthcare worker. To manage this, I adopted a reflecting approach, documenting and critically examining my preconceptions. This process allowed for a thoughtful consideration of how my connection to the field, along with past experiences, shaped the choice of theories, methods, and interactions with both older adults and care workers. Inevitably, these reflections also included my personal experiences of outdoor environments, acknowledging the range of pleasant and challenging situations I had encountered. To mitigate biases, I regularly engaged in discussions with my supervisors, each offering unique insights from their respective professional disciplines, which contributed to a balanced and multifaceted research process.

In the quantitative study (Study IV), the researcher's position is generally regarded as independent from the scientific phenomena being examined, implying a separation between the researcher's role and personal values or interpretations. However, the notion of complete independence can be questioned as the researcher's perspective inevitably influences the research process. Theoretical frameworks used to shape research questions also guide the interpretation of results (Moon et al., 2019). This potential influence has been carefully considered throughout the research and in the presentation of the results.

Since the four studies are at the intersection of healthcare science, architecture, and landscape architecture/environmental psychology, attention has been given to the methods, and reporting styles of each discipline. Additionally, my supervisors and I have been aware of epistemological challenges that can arise in interdisciplinary research, recognizing the differences between disciplines in terms of facts, rigor, causal explanations, and research goals (Brister, 2016). This awareness has been crucial in navigating the diverse perspectives to ensure a coherent, cohesive and credible body of work.

PERSON-CENTRED PRACTICE FRAMEWORK

The person-centred practice framework focuses on humanistic care with a moral component and therapeutic intent. It emphasizes building relationships between persons in need of care and rehabilitation, their significant others, and healthcare workers (McCance & McCormack, 2021). Although the framework originated in nursing within hospital settings, it is now applied more broadly across healthcare systems (McCormack et al., 2008; McCormack & McCance, 2006), including rehabilitation (Gracey & McMillan, 2021) and RCFs (Moore & Kelly, 2021). One of the central theoretical perspectives underpinning the framework is the framework of authentic consciousness by McCormack (2001, 2003), which focuses on person-centred practice with older adults, alongside views of McCance et al. (2001), which focus on the experiences of patients and nurses within the context of nursing care. With its philosophical grounding, the person-centred practice framework (Buetow, 2016) serves as a tool to improve care and rehabilitation by providing a common language that facilitates the implementation of person-centredness at person, team, organizational, and system levels. Core values underpinning the framework include respect for the person, building trust and understanding, treating a person as an individual, and developing positive relationships. The framework consists of four constructs: (1) prerequisites, (2) practice environment, (3) person-centred processes, and (4) outcome (McCance & McCormack, 2021), as illustrated in Figure 4.

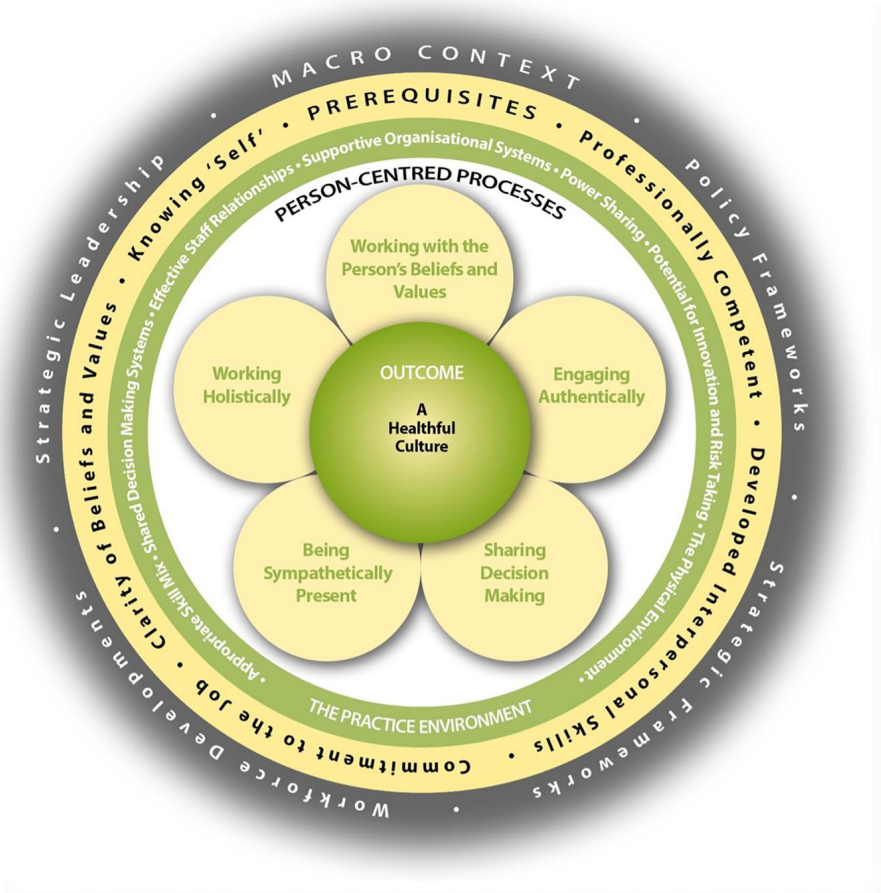


Figure 4. The person-centred practice framework. Illustration: T. McCance and B. McCormack (2021), permission received

The conditions encompass the attributes of the healthcare workers and are considered fundamental for delivering effective person-centred care and rehabilitation. These attributes include professional competence, interpersonal skills, commitment to work, demonstration of clarity of values and beliefs, and self-awareness. The practice environment focuses on the context in which healthcare is experienced. Seven different characteristics of the environment are developed within the framework: (1) appropriate skill mix, (2) effective relationships among healthcare workers, (3) sharing of power, (4) supportive organizational systems, (5) systems that facilitate shared decision making, (6) potential for innovation and risk taking, and (7) the physical environment itself. The person-centred processes focus on engagement that is necessary to create relations between persons, which include working holistically, working with a person's beliefs and values, sharing decision making, being sympathetically present, and engaging authentically. Lastly, the person-centred outcomes focus on the results

of person-centred care and rehabilitation in terms of a healthful culture (McCance & McCormack, 2021).

Since the physical healthcare environment is central in the thesis, this characteristic of the framework is explored in detail. The physical environment in healthcare settings aims to balance functionality with aesthetics by focusing on aspects such as design, universal access, dignity, choice and control, safety, privacy and sanctuary. Hence it is described as the visible and measurable space, encompassing aspects like size, furnishing, and decoration. Specific aspects of the physical environment relevant to outdoor healthcare environments include access to natural daylight indoors through windows, access to nature views from inside the buildings, and access to outdoor environments. Focusing on the significance of the physical environment highlights how both supportive and hindering environmental aspects can influence a person's health and well-being (Martin et al., 2021). However, the person-centred practice framework has faced some disadvantages in terms of exclusion of certain groups, for example the care worker's personhood, and of increasing personal and financial costs, and unfairness due to empathy (Summer Meranius et al., 2020). In this thesis, the physical outdoor environments are seen as possible environments for person-centred care and rehabilitation for both older adults and their care workers.

ECOLOGICAL MODEL OF AGING

The ecological model of aging (referred to as the ecological model) focuses the interaction between older adults and environments in terms of balancing pressure from the environments in relation to functional competences. Originating from gerontological science, the model describes older adults' behaviours and how these can be understood as products of competences (intellectual, emotional, and practical ability) in relation to environmental pressures (physical environment and psychosocial climate). According to the model, behaviours are a function of both the older adults and the environments. The model highlights that older adults with low competence more often than those with higher competence will behave in a way that is inadequate for the situation (Figure 5). Lawton and Nahemow (1973) noted that the environment has a significant impact on the aging process and individual behaviours. This reasoning traces back to Kurt Lewin's field theory (1951), which can be expressed as a mathematical formula. Lawton took Lewin's formula and refined it to predict the behaviour of older adults (Lawton, 1982; Lawton & Nahemow, 1973; Wolf et al., 2021). However, the model has been critiqued for not consider life experiences and their impact on expectations regarding the physical environment. Translated to the context of this thesis, this could mean that an older adult who has valued access to nature and outdoor environments may have higher expectations than someone without the same life experiences (Edvardsson et al., 2005). Another critique is that the model does not considering how environments can be used to meet needs or personal resources (Gitlin, 2003; Golant, 2003). In this thesis, the design of physical environments is viewed as either supportive or hindering for older adults related to

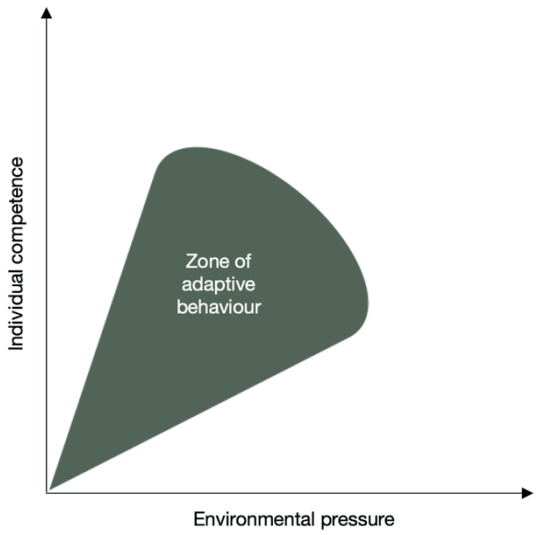


Figure 5. Ecological model of aging. Illustration: M. Liljegren, adaptation from Lawton and Nahemow (1973)

their physical conditions. The model focuses solely on the older adults and does not directly apply to the care worker, although their working conditions are facilitated by the support provided to the older adults through the environments.

PRINCIPAL MODEL OF FOUR ZONES OF CONTACT WITH THE OUTDOORS

The principal model of four zones of contact with the outdoors (referred to as the zone model) describes different zones in the physical environment where interactions with outdoor environments are possible.

The zone model originates from research in landscape architecture/environmental psychology, and is theoretically grounded in previous studies that show the positive effects of contact with outdoor environments in healthcare settings (Bengtsson, 2015). Specifically, it draws on evidence regarding the importance of views from inside the building (Ulrich, 1984; Ulrich et al., 2008; Velarde et al., 2007), healthcare gardens (Ulrich, 1999), and the perceived sensory dimensions in healthcare gardens (Grahn & Stigsdotter, 2010), as well as transition zones (Chalfont & Rodiek, 2005).

The zone model places the building as central and considers various types of outdoor environments with different proximities to the indoors. Contact with the outdoor environment begins already indoors through windows and glazed doors, which allow health-promoting natural daylight into the building and provide health-promoting

nature views (zone 1). Environments such as entrances, balconies, patios and conservatories act as the in between indoor and outdoor environments (zone 2). The building itself is situated on a property, which could contain a garden (zone 3). Beyond this, the property interacts with its surroundings, such as nearby parks or squares (zone 4). Some environments within buildings may lack windows and therefore offer no contact with the outdoor environment (zone 0). Figures 6 and 7 illustrate the zone model in plan and sector view, respectively. To clearly differentiate each zone, they are color-coded: zone 0 is red, zone 1 is orange, zone 2 is yellow, zone 3 is light green, and zone 4 is dark green (Bengtsson, 2015).

Each zone in contact with the outdoors can promote health and well-being in older adults (Bengtsson, 2015; Bengtsson & Lavesson, 2024). To positively impact health and well-being, it is essential to ensure access to all four zones (quantitative access), as well as access to outdoor environments with adapted design related to the target group (qualitative access) (Artmann et al., 2017; Bengtsson, 2015; Lin et al., 2022).

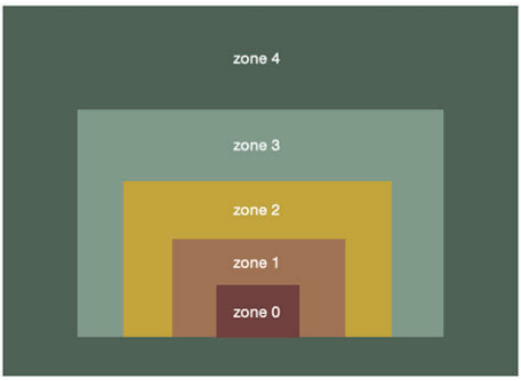


Figure 6. The zone model structure. Illustration: M. Liljegren, adaptation from Bengtsson (2015)

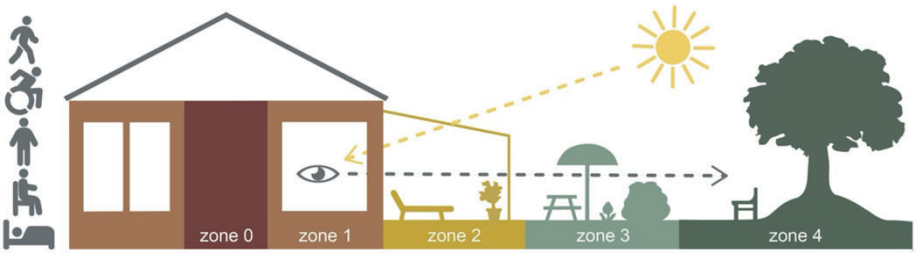


Figure 7. The zone model in sector view including different body positions. Illustration: A. Bengtsson (2018; 2024), permission received

A concept of body positions has been integrated into the zone model to illustrate person's condition for contact with the outdoor environments in healthcare settings (Figure 7). The body positions reflect varying levels of functional capacity, such as reduced muscle strength and balance issues, which may require mobility aids (walkers or wheelchairs). The body positions/functional capacity included are: 1) in motion (walking or using a wheelchair), 2) standing, 3) sitting, and 4) lying down. The zone model clarifies the need for access to all zones, regardless of body position or mobility. Persons with higher functional capacity are better able to move independently within and between zones 1-4, while those with lower functional capacity may require personal support (Bengtsson et al., 2018). For example, bedridden persons may need support to move their wheeled care bed in front of windows or to be moved to suitable environments in zones 2 or 3. The zone model is valuable as it provides a structured framework for organizing environments where outdoor contact is possible. The zone model can be used by practitioners to support the design, planning and managing of outdoor environments (Nordregio, 2024) as well as being useful in research (Bengtsson, 2015; Oher et al., 2024). To date, there has been no critique of the zone model in scientific publications. However, practical community projects have shown that it is problematic for the model to have the building as its basis (zone 1) since many project sites focus on the outdoor environments in the surrounding (zone 4). In these cases, the solution has been to reverse the model by exploring which zones have connections to a project site (Nordregio, 2024). In this thesis, the physical environments at RCFs are structured according to the zone model. The model focuses only on older adults and does not include the care workers' tasks related to the four zones.

QUALITY EVALUATION TOOL

The QET focuses on 19 evidence-based health-promoting environmental qualities in outdoor environments in healthcare settings. The tool originates from research in landscape architecture/environmental psychology, specifically within the context of healthcare environments. These qualities are organized into two design concepts: comfortable design and stimulating design. The more qualities present, the safer and more attractive the outdoor environment is perceived to be (Bengtsson, 2015; Bengtsson et al., 2022; Nordregio, 2024).

The concepts are linked to risk and salutogenic factors (Antonovsky, 1996; Bengtsson, 2015). Comfortable design focuses on reducing risk factors that may hinder the usability of the outdoor environments, while stimulating design promotes salutogenic factors, such as qualities that promote health. The comfortable design concept encompasses six environmental qualities: (1) closeness and easy access, (2) entrance and enclosure, (3) safety and security, (4) familiarity, (5) orientation and wayfinding, and (6) different options in different kinds of weather (Figure 8). The comfortable design qualities are crucial in outdoor environments within healthcare settings as they

Figure 8. Environmental design qualities for being comfortable outdoors. Illustration: M. Liljegren

support people's abilities to use the outdoor environments. Therefore, integrating these qualities throughout the environment ensures accessibility for all people on equal terms.

The stimulating design concept includes 13 environmental qualities that aim to make outdoor environments stimulating to use. These are divided into highly stimulating and low stimulating qualities. The highly stimulating qualities are: (7) contact with surrounding life, (8) social opportunities, (9) joyful and meaningful activities, (10) culture and connection to past, (11) openness, (12) species richness and variety, (13) sensory experiences of nature, and (14) seasons changing in nature. The low stimulating qualities are: (15) symbolism and reflection, (16) space, (17) serene and peaceful, (18) wildness and nature, and (19) secluded and protected. The stimulating design qualities play a key role in encouraging persons to spend time outdoors, fostering a sense of connection with nature and surrounding life. A gradient of challenge has been added to account for varying stimulation needs: highly stimulating qualities benefit those who are under-stimulated, while low-stimulation qualities support those who are overstimulated. Strategically placing these qualities ensures that people receive the appropriate support for their specific needs (Bengtsson, 2015; Bengtsson et al., 2022; Nordregio, 2024) (Figure 9).

Persons with physical disabilities have unique needs in outdoor environments. Given the diversity of user needs, it is supportive to have an overall idea where the different design qualities are placed in the outdoor environments in relation to one another to ensure an as positive and accessible environment as possible. A gradient of challenge supports the design process by providing a variety of possible experiences, which helps create an environment that is stimulating, restorative, and accessible to all users. The QET assists practitioners analyse design qualities for different target groups, supporting the development of outdoor environments that promote health and well-being (Bengtsson, 2015; Bengtsson et al., 2022; Nordregio, 2024). In Paper IV of this thesis, each quality is described in the context of RCFs through text and photos, providing a basis for the discussion section of the paper.

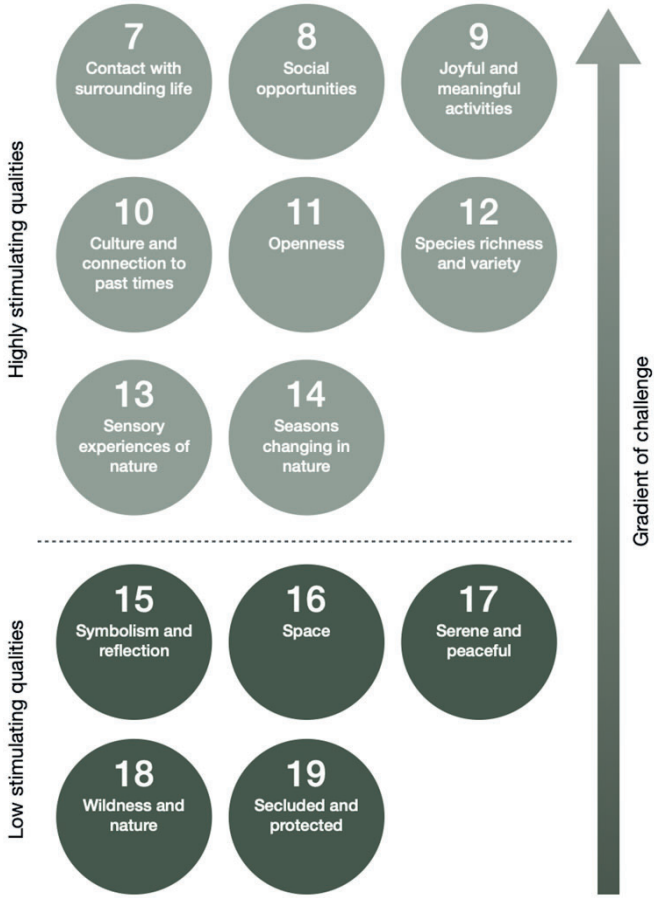


Figure 9. Environmental design qualities for being stimulated outdoors. Illustration: M. Liljegren

RESEARCH DESIGN AND METHODS

RESEARCH DESIGN AND METHODS

This chapter describes the methods of data collection and analysis used in Studies I-IV. It begins with a description of the study design, followed by an overview of the settings and participants, data collection methods, methods of analysis, and the connections between the studies. In the end, ethical considerations are described to highlight the decisions made to uphold good research practice.

STUDY DESIGN

Research in the intersection of healthcare science, architecture and landscape architecture/environmental psychology in relation to older adults, care workers, and the physical environment at RCFs presents a complex and multifaceted challenge, necessitating the use of several methods.

The method required to achieve the specific aim of each study needed to generate insights that would be applicable in practice. Therefore, qualitative semi-structured walking interviews (individual with older adults and focus groups with care workers) (King & Woodroffe, 2019), and quantitative mapping were deemed particularly suitable. The methodological framework adopted in this thesis is a multi-method design, which means both qualitative and quantitative approaches were used for data collection and analysis (Anguera et al., 2018). This design enabled comprehensive exploration of the research aim. Each of the four studies was theoretically grounded. In Study I, both the ecological model and the zone model were used, while Study II applied the person-centred practice framework and the zone model. Studies III and IV were based on the zone model, with Study IV also incorporating the QET. The data generated was analysed using qualitative content analysis, thematic analysis, zone model analysis, descriptive statistics, and correlation analysis. Table 1 provides a summary of the studies.

SETTINGS AND PARTICIPANTS

Study I focused on exploring the needs and wishes of older adults concerning their perceived need for contact with outdoor environments, while Studie II focused on the care workers' reflections on the outdoor environment as an arena for care and rehabilitation. In Study I, the ecological model was applied on an overall level to understand the supportive and hindering aspects of the physical environments. In Study II, the person-centred practice framework was used to understand the different types of environments that may be suitable for care and rehabilitation. In Studies I and

Table 1. Overview of Studies I-IV

	Study I	Study II	Study III	Study IV
Design	Qualitative	Qualitative	Quantitative	Quantitative
Theoretical perspective	Ecological model and zone model	Person-centred practice framework and zone model	Zone model	Zone model QET
Data collection	Semi-structed walking interviews, individual	Semi-structed walking interviews, focus groups	-	National mapping
Settings and participants	3 RCFs in the Region of Gothenburg, 12 older adults	3 RCFs in the Region of Gothenburg, 11 care workers	-	2,036 Swedish RCFs
Materials	Interview guide	Interview guide	-	Matrix and manual
Data analysis	Qualitative content analysis and zone model analysis	Thematic analysis and zone model analysis	-	Descriptive statistics and correlation analysis

II, the zone model provided a structure for each interview guide. The study sample consisted of twelve older adults living at three RCFs (Study I) and eleven care workers employed at the same three RCFs (Study II). No participants were involved in Study III and IV. For the national mapping study (Study IV), the sample consisted of 2,036 RCFs. Settings and participants are further described under respective headings below.

SETTINGS IN STUDY I AND II

The inclusion criteria for the RCFs in Study I and II were provision of care and rehabilitation for older adults round-the-clock, located in Sweden and in the Region of Gothenburg (a member organization representing 13 municipalities in southwestern Sweden). Recruitment was carried out at both municipal and RCF levels. The recruitment process for municipalities began by establishing contact with a representative from the Region of Gothenburg. To ensure a diverse sample of RCFs, a sampling frame was developed based on the zone model (Bengtsson, 2015), and designed to maximize variation in key characteristics. The frame used a national classification of municipalities which considered aspects such as population size, geographic density, and proximity to major cities or urban areas (The Swedish Association of Local Authorities and Regions, 2023b). The goal was to recruit three municipalities, each representing a different classification.

The contact person from the Region of Gothenburg described the intentions with Study I and II to the chief network, resulting in two municipalities with differing classification reporting interest in participating. The research group analysed the remaining municipalities and identified only one that met the unrepresented classification criteria. After discussing recruitment strategies, the research group requested that the contact person specifically approach this municipality, which then agreed to participate. In total, three municipalities were recruited, representing the intended variation in key characteristics.

The next step in the process was to recruit three RCFs from the recruited municipalities. The recruitment process proceeded as follows: the research group identified two RCFs from each municipality based on information from websites and online maps. A representative responsible for RCFs in each municipality was contacted to provide additional detailed information about the respective RCFs. This information was compiled into a matrix along with assessments of aerial photos. Site visits to the six RCFs were conducted to gain more information of access to the four zones. Based on the collected information and observations, one RCF from each municipality was purposively selected. The managers of the three selected RCFs were then contacted and invited to participate in the studies, all of whom agreed. Together, the recruited RCFs represented the desired diversity of access to the four zones.

The buildings and outdoor environments at the selected RCFs varied significantly, reflecting their unique locations and design. RCF 1 was a single-floor building with several windows, offering access to shared patios, a conservatory, and a garden. The RCF was located on the edge of a smaller community near a forest. Figure 10 represents a plan view of the RCF structured according to the layout of the zone model, while Figure 11 provides an arial view. Figure 12 shows photos from each zone, and Figure 13 a schematic illustration of the transition points from apartment to garden. RCF 2 was a three-floor building with several windows as well as access to shared balconies, patios, and a garden. It was located in the middle of a town (Figures 14, 15, 16, and 17). RCF 3 was a nine-floor building with access to several windows, both private and shared balconies along the facades, and a shared courtyard park that was not part of the RCF property but used as a garden. It was located in a large city close to a square (Figures 18, 19, 20, and 21). Further details of the RCFs are provided in Table 2.

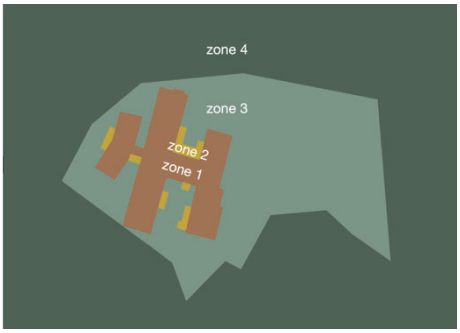


Figure 10. RCF 1 illustrated according to the zone model. Illustration: M. Liljegren

Figure 11. Aerial view of RCF 1 with marked plot boundaries. ©Lantmäteriet

Figure 12. Zones 1-4 at RCF 1. Photos: M. Liljegren

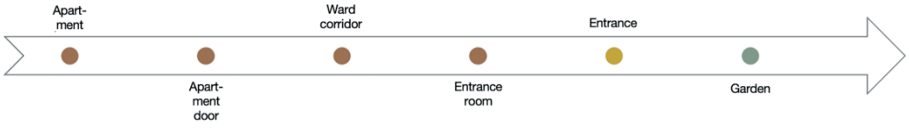


Figure 13. The six transition points from apartment to garden at RCF 1. Illustration: M. Liljegren

Figure 14. RCF 2 illustrated according to the zone model. Illustration: M. Liljegren

Figure 15. Aerial view of RCF 2 with marked plot boundaries. ©Lantmäteriet

Figure 16. Zones 1-4 at RCF 2. Photos: M. Liljegren

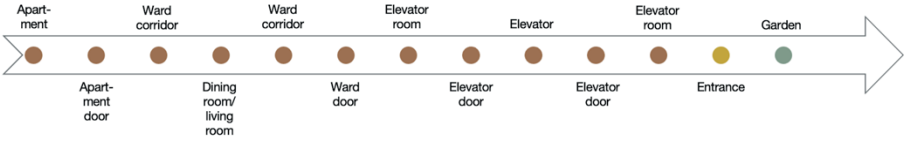


Figure 17. The 13 transition points from apartment to garden at RCF 2. Illustration: M. Liljegren

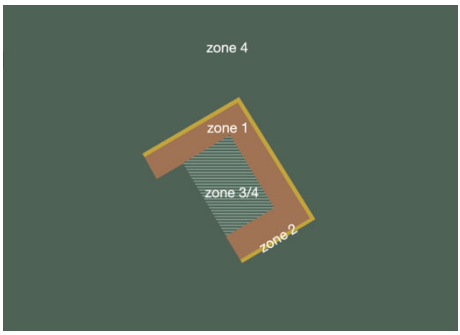


Figure 18. RCF 3 illustrated according to the zone model. Illustration: M. Liljegren

Figure 19. Aerial view of RCF 3 with marked plot boundaries. ©Lantmäteriet

Figure 20. Zones 1-4 at RCF 3. Photos: M. Liljegren

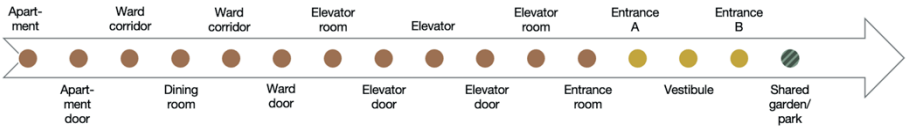


Figure 21. The 16 transition points from apartment to shared garden/park at RCF 3. Illustration: M. Liljegren

Table 2. Description of RCFs included in Studies I and II

RCFs	Municipal group classification	Number of floors and older adults	Zone 1	Zone 2	Zone 3	Zone 4
RCF 1	Commuter municipality close to smaller city/town	1 floor/ 35 older adults	Exists	Common patios and a conservatory	Large garden with vegetation and garden pond	Smaller community, forest lot at the back
RCF 2	Commuter municipality close to a city	3 floors/ 71 older adults	Exists	Balconies and patios	Height variation in the backyard garden	Centrally located in a residential area
RCF 3	City	9 floors/ 84 older adults	Exists	Balconies	Shared garden/park	Central in city, multi-story buildings, proximity to squares

SETTINGS IN STUDY IV

There were also specific settings for Study IV. The inclusion criterion for study IV was RCFs in Sweden. This study was a national mapping, that is all RCFs regardless of operator type (municipal, private, or foundation) were included (n=2,036).

PARTICIPANTS IN STUDY I

The total number of participants consisted of twelve older adults (nine women and three men) from the three selected RCFs. Each participant took part in an individual walking interview. To capture a wide range of experiences, purposive sampling was employed, aiming for variety in participants' age, body positions/functional capacity, years of residence at RCFs, and residential floors. The recruitment process was as follows: the managers of the three selected RCFs distributed written information about the study to all older adults (n=190). Older adults who expressed interest were asked to notify the managers, who then proposed participants to the research group based on the predetermined criteria. On the day of the interview, the final selection was made based on both willingness to participate and current health status. Informed consent was obtained from the participants prior to the start of the interviews. The managers were helpful in this process. The included participants reflected the desired variety. Several older adults used mobility aids, such as walkers or wheelchairs (both manual and electric). The inclusion criteria specified that participants had to be able to communicate verbally in Swedish; those with a diagnosis of severe cognitive decline were excluded. Table 3 provides details on the participants. Five participants chose to bring a care worker or relative to the interview for support. These persons were not included in the study.

Table 3. Description of older adults who participated in Study I

Age	Body positions /functional capacity	Years living at RCFs	Residential floors
71–80 years old (n=2)	In motion/ standing independently (n=2)	Less than one year (n=2)	Floor 1 (n=4)
81–90 years old (n=4)	In motion/ standing, used walker independently (n=3)	One year (n=3)	Floor 2 (n=2)
91 years old or older (n=6)	In motion/ sitting, used wheelchair independently (n=3)	Two years (n=2)	Floor 3 (n=3)
	In motion/ sitting, used wheelchair, dependent on personal support (n=4)	More than two years (n=5)	Floor 4 (n=1)
			Floor 5 (n=1)
			Floor 6 (n=1)

PARTICIPANTS IN STUDY II

Eleven care workers with diverse professional roles participated in three focus group walking interviews. To ensure a range of experiences, purposive sampling was used, including variations in profession (social care workers and healthcare workers), years working at RCFs, age, and gender. At all three RCFs, the social care workers and healthcare workers belonged to separate organizations with different managers, necessitating two recruitment processes. The recruitment process for social care workers (assistant nurses and activity leaders) proceeded as follows: all assistant nurses and activity leaders received oral and written information about the study from their respective managers at the selected RCFs. Those interested in participating were asked to inform their manager, who then relayed the information to the research group. The final selection of participants was made by the research group and communicated back to the respective managers, who in turn notified the social care workers. Once the selected participants had given their consent to the researcher, the interviews commenced.

The recruitment process for healthcare workers (nurses, occupational therapists, and physiotherapists) was as follows: the managers of the three selected RCFs first contacted the respective healthcare managers, providing them with both oral and written information about the study. The healthcare managers who expressed interest received additional details and distributed this information to the healthcare workers at the specific RCFs. Healthcare workers interested in participating reported their interest to their healthcare manager, who then forwarded this information to the RCFs managers. The RCFs managers, in turn, informed the research group of the interested healthcare workers. The research group conducted the final selection of participants and communicated the results back to the RCFs managers, who relayed the information

Table 4. Description of care workers who participated in Study II

Profession	Years working at RCF	Age	Gender
Social care worker: Activity leader (n=1)	Less than 1 year (n=3)	21–30 years (n=1)	Female (n=9)
Social care worker: Assistant nurse (n=2)	1–3 years (n=3)	31–40 years (n=2)	Male (n=2)
Social care worker: Activity leader and assistant nurse (n=1)	4–6 years (n=1)	41–50 years (n=5)	
Healthcare worker: Nurse (n=3)	More than 6 years (n=4)	51–60 years (n=3)	
Healthcare worker: Occupational therapist (n=2)			
Healthcare worker: Physiotherapist (n=2)			

to the healthcare managers. The selected healthcare workers were subsequently informed, and on the interview day, they provided their consent to the researchers. The group of recruited care workers comprised eleven persons, representing the desired range of competencies initially sought. The inclusion criteria specified that participants had to be able to communicate verbally in Swedish. Table 4 provides a detailed description of the care workers.

DATA COLLECTION METHODS

The zone model was used in all four studies to provide a comprehensive description of the health-promoting potential of the physical environments at RCFs. The methods included qualitative walking interviews with older adults and care workers, as well as a quantitative mapping of access to outdoor environments in zones 1-4. Data collection with the older adults (Study I) took place in July 2022, and with the care workers (Study II) in May 2022. The development of the matrix and manual (Study III) and the national mapping of access to outdoor environments (Study IV) spanned three years (2022-2024). Each method is outlined below.

WALKING INTERVIEWS

Walking interview is a qualitative research method well-suited to interdisciplinary studies that explore the interaction between persons and their environments. This method allows for deeper exploration of lived experiences within specific environments by combining questions with observations of movements within those

environments. Therefore, semi-structured individual walking interviews were conducted with the older adults and as focus group walking interviews with the care workers (King & Woodroffe, 2019). Semi-structured interviews entailed starting with a set of prepared questions, with a possibility for follow-up questions to provide further information (Polit & Beck, 2021). Individual interviews were considered most appropriate for the older adults due to their health conditions and to enable the interviewer to give them full attention. For the care workers, focus groups were considered more suitable as they could be inspired by each other's responses, potentially stimulating recall of additional insights (Halkier, 2017; Krueger & Casey, 2015).

An interview guide with open-ended questions, based on the zone model (Bengtsson, 2015), was developed and followed for each study. Both guides are presented in Appendix A and B (in Swedish). The questions focused on the older adults and care workers' experiences of each zone, the transitions between them, and their use.

A few weeks before the interviews started, information sheets were put up at the RCFs to ensure that everyone was aware of why the interviews took place in the common environments and why unknown people (researchers) visited the RCFs. It was important to conduct the walking interviews in environments where the older adults and care workers felt comfortable. Therefore, the participants were given freedom to choose which environments they wanted to visit for the interviews. They were made aware that they could decide what they wanted to show and share. The walking interviews with the older adults began indoors (zone 1), most of them preferred to start in their apartments. Only one interview began in a public room due to cigarette smoke in the apartment. Before the interviews, managers or care workers had received the older adults' approval of the arrangement. The interviews with the care workers also began indoors, specifically in activity rooms. Once the questions concerning zone 1 were completed, the participants and researchers proceeded to zone 2, followed by zone 3. Discussions about zone 4 took place in zone 3 due to concerns over the older adults' frail health and the time required to reach the more distant environments. In some of the interviews with the older adults, questions had to be prioritized to ensure they had enough energy to share their experiences of several zones. The walking interviews with the older adults lasted between 28–80 minutes, and between 80–96 minutes with the care workers. All walking interviews were audio-recorded and transcribed verbatim. To ensure transparency and completeness in reporting of study design, analysis, and results for Studies I and II, the research group followed the COnsolidated criteria for REporting Qualitative research (COREQ) (Tong et al., 2007).

DEVELOPMENT OF MATRIX AND MANUAL

Studie III developed a matrix and manual for quantitative mapping of accesses to environmental aspects in outdoor environments at RCFs. The aim of the study was to propose an approach for mapping access to different types of physical environmental aspects in zones 1-4, and a manual to guide research assistants in how to collect the

data. The matrix was developed deductively based on the zone model (Bengtsson, 2015), chosen for its structured framework that describes the health-promoting potential of physical environments. The matrix and manual were part of a ten step process (Figure 22). The first steps were to identify a suitable theoretical basis (the zone model), identify sources for data collection (such as architectural drawings and online map services), and identify and define physical environmental aspects of importance to older adults and care workers at RCFs. These were based on previous research and insights from the research group's experiences of RCFs. Since the study focused solely on the quantitative access to environmental aspects, there were no direct connections between the matrix variables and the 19 health-promoting qualitative design qualities in QET. However, these qualities served as a source of overall inspiration. The following steps involved the development of the matrix and of the manual as well as conducting a pilot study. All addresses for the Swedish RCFs and municipal building permit units were identified. The addresses for the RCFs were needed to access the drawings from the building permit units. Following this, adjustments were made to the matrix and manual, and quality assurance measures were performed. As a final step, the national mapping of the access to outdoor environments was completed. At this stage, the research assistants were also instructed to document interesting design solutions for each zone to showcase various examples.

MAPPING ACCESS TO OUTDOOR ENVIRONMENTS ON A NATIONAL LEVEL

Studie IV focused on mapping access to outdoor environments at Swedish RCFs on a national level. The matrix and manual developed in Study III were used in Study IV. This section provides a detailed description of the data extraction approach. The identification of RCFs was carried out in collaboration with the Swedish National Board of Health and Welfare, which provided two address lists containing information from 2019 and 2021. The absence of a complete address register for 2020 was due to disruptions caused by the COVID-19 pandemic. After processing the data, an address register of 2,036 RCFs was attained, categorized into publicly run RCFs (n=1,564, 76.8%), and privately operated (n=389, 19.2%). Data on the providers were missing for some of the RCFs (n=83, 4.0%). Nevertheless, most of the municipalities (n=262, 90.3%) provided the requested materials, and drawings were obtained for most of the RCFs (n=1,811, 88.9%). The drawings included site drawings, facade drawings and floor plans, which allowed for data extraction related to access to zone 1 (windows), and zone 2 (entrances, balconies, patios, and conservatories). To map the access to zone 3 (gardens) and zone 4 (surroundings), open access online maps from the Swedish Land Survey were used (The Swedish Land Survey, 2023). These maps, based on municipal data, provided information on buildings on the plots, vegetation, community features, transport infrastructure, and public areas such as parks and squares. For variables concerning zone 3 and zone 4, data were obtained for most RCFs (n=1,917-1,997, 94.2%-98.1%).

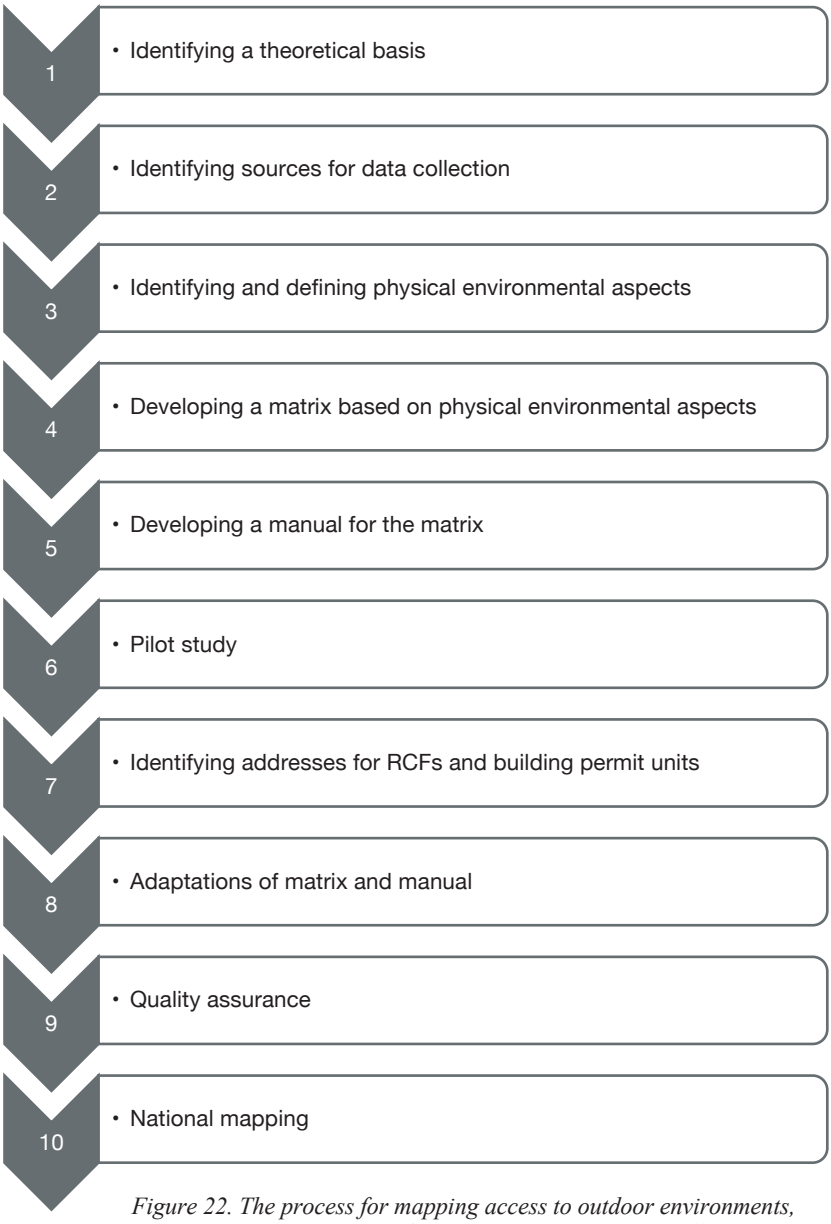


Figure 22. The process for mapping access to outdoor environments, including the development of the matrix and the manual. Illustration: M. Liljegren

Most of the data was collected by two research assistants, with contributions from me as PhD student. The research group collaborated closely throughout the process as the matrix was developed in parallel with the data extraction. Additional adjustments to the matrix were made during the extraction of data from the first 200 RCFs. The manual was updated in parallel. Random checks were conducted for all four zones after every 200 RCFs to further ensure data accuracy. These checks revealed some discrepancies in the assessments, prompting further refinements to the matrix. Finally, access to all zones for the current RCFs were mapped using the final versions of the matrix and manual. During the data extraction, interesting design solutions were documented for each zone, highlighting the supportive and hindering physical environmental aspects. This documentation was not part of the quantitative data collection and therefore did not require further analysis.

Furthermore, the study included a direct connection to the 19 health-promoting design qualities, each of which was specified with text and photos based on the context of Swedish RCFs.

DATA ANALYSIS

Studies I and II included qualitative data analysis and analysis based on the zone model, and Study IV focused on quantitative data analysis. Each analytical procedure is described below.

QUALITATIVE CONTENT ANALYSIS

In Study I, qualitative content analysis was used to systematize the data from the walking interviews with the older adults (Lindgren et al., 2020). This method is suitable for conducting research in areas with limited existing knowledge (Green & Thorogood, 2014), as was the case here, where the needs and wishes of older adults with varying body positions/functional capacities related to zones 1-4 at RCFs have not yet been studied. An inductive approach was adopted, analysing the manifest content (Graneheim et al., 2017). The process began with familiarization of the entire dataset, followed by identification and condensation to meaning units. No software was used in the analysis. The analysis led to the generation of initial codes, which were grouped into sub-categories and categories. The analysis was iterative, including repeated revisiting of the data. To increase credibility and reach consensus, the research group held additional discussions. Furthermore, since observations are part of the walking interview method, it is also important to highlight how this information was handled during the analysis. The observation notes were not analysed separately but were used solely to support the qualitative content analysis, providing clarifications when necessary.

THEMATIC ANALYSIS

In Study II, thematic analysis was used inductively to analyse the manifest content from the walking interviews with the care workers. In contrast to qualitative content

analysis, thematic analysis offers a more detailed and nuanced account of data (Braun & Clarke, 2006, 2014; Clarke & Braun, 2017), which is why it was deemed suitable for analysing the interviews. The process began with the transcription and data familiarization, followed by reading, re-reading, and writing notes about ideas. Next, interesting phenomena were systematically coded in the program NVivo and grouped into sub-themes, themes, and an overall theme. Finally, each theme was defined, and discussions within the research group took place to achieve consensus and increase credibility.

ZONE MODEL ANALYSIS

In Study I and II, deductive analyses of the physical environments were conducted to identify supporting and hindering aspects based on the zone model (Bengtsson, 2015), aiming for increased insights of zones 1-4. Significant aspects for each zone were categorized, and discussions within the research group were held to reach consensus. In Paper II, the zone model analysis as a method is clearly articulated, and less so in Paper I. However, the processes were the same.

STATISTIC ANALYSIS

In Study IV, quantitative data were analysed by using descriptive statistics and correlation analysis (Norman & Streiner, 2008). All data were organized in the programs Microsoft Excel, Minitab, and Statistical Package for the Social Sciences (SPSS).

CONNECTIONS BETWEEN THE STUDIES

Studies I and II are interconnected in that data collection was conducted at the same three RCFs using similar methods. This allowed greater insights of each RCF's zones as more interviews were conducted. Additionally, the interview guides for each study were based on the zone model and contained similar questions, though they were tailored to the respective participant groups. Furthermore, Studies III and IV are also closely linked, with Study III focusing on the development of a matrix and manual for mapping access to zones 1-4, which were then applied in Study IV. As adjustments to the matrix and manual for data extraction were required for the first 200 RCFs to reach the final versions, the process became iterative between the two studies. The connection between Studies I and II and III and IV lies in that the former set substantiated physical aspects of outdoor environments that could be found at RCFs, thus facilitating decisions about which variables to include in the matrix.

ETHICAL CONSIDERATIONS

Ethical considerations were continuously addressed and reflected upon throughout the four studies. Research including older adults with decreasing health and reduced functional and/or cognitive capacities requires special attention. The conditions for the

care workers were also carefully considered. All studies adhered to the principles outlined in the Helsinki Declaration (The World Medical Association, 2024), and ethical approval was granted by the Swedish Ethical Review Authority (diary number: 2020-06643, and 2022-02682-02).

Conducting research within RCFs involves entering not only the homes and daily lives of older adults but also the workplaces of care workers. This means encountering a broad range of personalities, abilities, disabilities, and environmental experiences. Research at RCFs requires adaptations to accommodate the needs of older adults, care workers, and researchers. One adaptation was to allow time for sharing information and conducting the interviews.

To reflect the population of older adults at RCFs in the mid-2020s, the goal was to include persons with varying levels of body positions/functional capacities. Although most of the older adults had decreasing health, this was not a reason to exclude them from having their voices heard in research studies. Like any other groups in society, older adults at RCFs have the right to have their specific conditions highlighted through research. To explore the relationship between older adults and the physical environments at RCFs, it was considered necessary to include them, even if some had limited autonomy. However, it was important to be aware that these conditions existed and could fluctuate over time.

Before obtaining informed consent from the older adults and the care workers, both groups were provided with written and verbal information about the purpose of each study and the details of their participation. They were informed about confidentiality, their right to withdraw at any time, and that participation was entirely voluntary. Additionally, all participants were made aware that their information would be used for research purposes, and any quotes published from the interviews would be anonymized. In Study I, eleven of the twelve older adults provided written informed consent. One consented orally due to a personal principle of not signing documents. All eleven care workers in Study II provided written informed consent.

Despite the careful ethical considerations, challenges remained, particularly concerning the risk of compromising the integrity of older adults and care workers. To mitigate this, the researchers were extra sensitive to any potential risks or signs of discomfort during the studies. No interviews were conducted in situations that could be deemed uncomfortable or intrusive, and photos were limited to common indoor and outdoor environments without persons.

During and after the interviews, there was a potential risk that the older adults could become more aware of their vulnerability given their reduced functional capacity. This concern stemmed from the interviews' focus on both the supportive and hindering aspects of their movements through various environments. There was also a potential risk that the older adults could become aware of how rarely they spent time in outdoor environments. Similarly, there was a risk for the care workers that participation in the interviews could make them realize that they were not using the health-promoting

potential of the outdoor environments. These insights could negatively affect both the older adults and the care workers. Additionally, to protect the older adults and care workers' identities, the interviews were recorded, stored, and anonymized, ensuring that no unauthorized access was possible.

A final ethical consideration that needs to be addressed concerns the results from Paper IV. Since the physical environment is an integral part of person-centred care and rehabilitation (McCormack et al., 2021), the results indicating lack of access to outdoor environments at RCFs may lead to older adults and care workers experiencing unequal conditions, which could negatively affect their health and well-being. Therefore, this should be considered by the national and local decision-makers as well as by the managers of RCFs.

RESULTS

RESULTS

This chapter presents the results of Studies I-IV concerning outdoor environments at RCFs. The results focus on needs and wishes of older adults in contact with outdoor environments at RCFs, as well as on the care workers' reflections on the outdoor environments as arenas for person-centred care and rehabilitation. Furthermore, the chapter presents the developed matrix and manual for mapping access to outdoor environments, as well as how accesses to the physical environmental aspects in outdoor environments at RCFs look like at the national level in Sweden.

PAPER I: OLDER ADULTS' NEEDS AND WISHES FOR CONTACT WITH THE OUTDOORS

This study explored the needs and wishes of older adults for contact with outdoor environments at RCFs and what implications these may have for theory and practice. The two categories resulting from the qualitative content analysis *Outdoor environments as part of everyday life* and *Getting outdoors in practice* were identified when the individual walking interviews were analysed.

The first category *Outdoor environments as part of everyday life* described outdoor stays as normal, constituting a link between life in ordinary residences and at the RCFs. Not being able to be outdoors as much as desired was what the older adults missed most after moving to RCFs. A woman, 91 years old or older using wheelchair and dependent on personal support said: 'It's this (outdoor stays) I miss the most (after moving to an RCF).' The outdoor environments constituted important environments for socializing, privacy, exercise, activity and rest. The older adults also expressed needs for outdoor stays regardless of the season or weather, preferably on a daily basis. This category was further divided into four sub-categories: *Outdoor stays as a link between life in ordinary residences and at RCFs*; *Places for socializing and privacy*; *Places for exercise, activity and rest*; and *Outdoor stays despite the season and the weather*.

The second category, *Getting outdoors in practice,* described appreciated aspects supporting contact with the outdoors and outdoor stays, such as open windows and doors, electronic/automatic door openings and access to elevators. Additional supportive aspects were access to balconies, patios, conservatories, gardens and the surroundings. A woman, 91 years old or older and independent movement wise said: 'It would have been nice to have your own balcony.' Several aspects hindered the contact and made outdoor stays more difficult, for example, long distances as well as small balconies. Additional hindering aspects were lack of introduction to outdoor

environments, tricky locking systems, and how to find one's way back into the building. Dirty windows, messy balconies, and outdoor litter had a negative impact on the willingness to invite relatives and acquaintances for visits at the RCFs. The experience of accessibility, both indoors and outdoors, was linked to the different body positions and the need for mobility aids. Older adults who were independent experienced the accessibility as satisfactory whereas those who used walkers or wheelchairs encountered difficulties. Access to personal support also played a crucial role, ranging from assistance with arm-in-arm walking to full support for wheelchair users. Being dependent on care workers and asking for help was perceived as difficult, and a lack of personal support meant that some had never visited the gardens at RFCs. A woman 71-80 years old using a wheelchair and dependent on personal support explained: 'It is difficult to get help, constantly asking for help and help and help and help.' This category was further divided into four sub-categories: *Supporting aspects*; *Hindering aspects*; *Accessibility in relation to body positions;* and *Access to personal support*. For specific details about supporting and hindering aspects (*zone model analysis*) see Paper I (Table 6 and 7).

PAPER II: CARE WORKERS' REFLECTIONS OF THE OUTDOOR ENVIRONMENT AS AN ARENA FOR PERSON-CENTRED CARE AND REHABILITATION

This study explored the care workers' reflections on the outdoor environment as part of care and rehabilitation. The overall theme resulting from the thematic analysis *Outdoor environment as arena for person-centred care and rehabilitation* illustrated the care workers' reflections on the outdoor environment as potential and challenge for person-centred care and rehabilitation. The three themes: *Potential for health*; *Potential for enriched everyday life*; and *Challenges for operational development* were identified when the walking interviews as focus groups were analysed. Additionally, the results included a *zone model analysis* in terms of categorization of important aspects within each zone.

The first theme *Potential for health* described how nature views from inside the building and outdoor stays responded to fundamentally inherent instincts and met basic human needs, for both older adults and care workers. The outdoor environments offered a variety of sensory experiences which supported their health. Being outdoors was of importance, a need that persisted year-round and regardless of weather. The care workers reflected that many older adults tended to stay indoors because they required personal support to go outdoors. They also reflected on the importance of offering bedridden older adults views of nature because they themselves could not influence what is in their line of sight. The outdoor environment also provided an environment for care workers to recover, leading to clearer, more positive thinking and renewed energy. A healthcare worker/nurse said: 'I had to go outdoors and get fresh air and then come back and start again with energy.' For the older adults, outdoor stays

also seemed to provide new energy, which led to increased alertness, improved mood, good appetite, and reduced anxiety. The theme was further divided into two sub-themes: *Meet basic human needs* and *Improve well-being*.

The second theme *Potential for enriched everyday life* described how nature views, watching people pass by, and outdoor stays positively stimulated older adults. The care workers reflected on balconies as good alternatives to gardens for older adults living at multi-floor RCFs. Outdoor walks were a source of stimulation for both older adults and care workers. A social care worker/assistant nurse said: 'What I can see is a joy, the joy in their eyes when I go outdoors with them.' Nature views and outdoor stays seemed to encourage physical activity and maintain mobility by distracting the older adults. The care workers described everyday movements, both indoors and outdoors, as beneficial exercise for the older adults as it challenging their balance on varied surfaces. The overall idea of offering older adults exercise outdoors was described in positive terms and was considered to be beneficial for both the older adults and the care workers. Furthermore, an enriched everyday life was supported by access to a variety of outdoor environments such as balconies, patios, gardens and parks, providing older adults with choices. The access allowed for new experiences, promoted a person-centred approach, and entailed self-determination. Care workers mentioned the value of high-quality of design in outdoor environments for older adults, especially those using mobility aids. They also noted a lack of suitable outdoor environments for their own breaks, such as places for meals and relaxation. The theme was further divided into three sub-themes: *Stimulating days*; *Inspire physical exercise and maintain physical activity*; and *Offer variety, choice, and self-determination*.

The third theme *Challenges for operational development* described care workers' mixed experiences using outdoor environments with older adults—some found it natural and enjoyable, while others had not considered it. A healthcare worker/physiotherapist said: 'It (the outdoor environment) is not used by me at all. I have never been there.' The interviews revealed that those with less experience gained new insights through reflections and peer examples. A healthcare worker/nurse reflected: 'After this (the interview), now that I think about it, I had never thought of doing work tasks outdoors, but some work tasks can really be done.' Although most tasks were performed indoors, such as activities, meals, conversations, anamnesis, assessments, sampling, exercises, and follow-ups, many of these could be done in outdoor environments. Mentioned challenges concerning older adults' outdoor stays included lack of planning and communication among the care workers, care-worker shortage, limited time, and uncertainty about the outdoor environments and how these could be used. The care workers personal attitudes toward outdoor stays often influenced whether older adults in need of personal support visited the outdoor environments or not. A healthcare worker/nurse explained: 'I think the conditions are there. A lot is also about the commitment of those of us who work here and time and that bit. There may often be time, but you have to ... there has to be a little will, too, in some way. It could also be what is missing.' The theme was further divided into two sub-themes: *Outdoor environment as an asset* and *Organizational challenges*.

Categorization of important aspects of the zones in terms of a *zone model analysis* highlighted both supportive and hindering aspects for contact with the outdoors such as layout, the number of floors, windows, entrances, locking systems, access to different directions and places, sufficient size, furniture, plants, and paths. For specific details see Paper II (Table 6).

PAPER III: DEVELOPMENT OF THE MATRIX AND MANUAL

This study developed a matrix and manual for quantitative mapping access to outdoor environments at RCFs. The matrix included 26 variables, which were divided into the four different zones. For Zone 1, seven variables were developed; for Zone 2, six variables; for Zone 3, nine variables; and for Zone 4, two variables. These variables focused on physical environmental aspects, along with two background variables that pertained to the characteristics of RCFs. The latter are important as they influence contacts with the outdoors and outdoor stays for both the older adults and the care workers. The mapping was guided by the manual. The matrix is presented in Table 5, and the manual in an appendix as it is comprehensive (Appendix C).

Table 5. The variables in the matrix

Zone	Variables
Back-ground	• How many floors are in the building? • How many assisted living apartments are in the building?
1	• Are there windows/French balconies in contact with the outdoor environment in the common rooms (e.g., activity room, meeting room, therapy room, café, spa, library)? • Are there windows/French balconies in contact with the outdoor environment in dining areas and living rooms/day rooms? • Are there windows/French balconies in contact with the outdoor environment in the apartments? • Are there windows/French balconies in contact with the outdoor environment in the conference rooms? • Are there windows/French balconies in contact with the outdoor environment in the care workers' dining rooms? • Are there windows/French balconies in contact with the outdoor environment in the offices? • Are there windows/French balconies in contact with the outdoor environment in the care workers' relaxing rooms?
2	• Are there entrances to the outdoor environment (excluding delivery entrances/entrances to garbage rooms)? • How many balconies/patios/conservatories for older adults are there in direct connection to the building? • How many apartments per balcony/patio/conservatory are there? • How many balconies/patios/conservatories for care workers are there in direct connection to the building? • How many greenhouses/orangeries/independent conservatories are there? • How many roof terraces are there?

3	• How many square meters does the plot make up (including the building/s)? • Based on the previous variable, what is the plot size range (including building/s)? • Is there an outdoor environment on the ground floor in direct connection to the RCF within the plot? • How many square meters of the plot constitute an outdoor environment with vegetation rounded to tens of square meters (including enclosed courtyards, excluding parking space and traffic routes)? • What is the size of the outdoor environment with vegetation (e.g. garden) per apartment? • How many buildings are there on the plot (both connected and unconnected, excluding pavilions, sheds etc.)? • How many enclosed courtyards are there on the plot? • How many open courtyards are there on the plot? • How many courtyards are there on the plot in total (both enclosed and open courtyards)?
4	• What kind of environment surrounds the RCF? – Enclosed buildings? – High-rise buildings? – Low-rise buildings? – Sparse buildings? – Open land – park? – Open land – nature? – Cultivation land? – High vegetation? – Water contact? – Industrial and commercial area? – Transport infrastructure? – Community features? • Is there a public outdoor environment in the immediate surroundings within a radius of approximately 300 meters distance from main entrance? – Public open space? – Public area intended for physical activity? – Public area with high vegetation? – Public area with water contact? – Square?

PAPER IV: LACK OF ACCESS TO OUTDOOR ENVIRONMENTS AT SWEDISH RCFS

This study mapped access to outdoor environments for older adults and care workers at RCFs on a national level in Sweden (n=2,036). First, some characteristics of the RCFs included in the study will be presented. The most common building type was two-floor buildings (32.6%), followed by three-floor buildings (22.6%). Only 18.2% of the RCFs were one-floor buildings, meaning they were at ground level. Regarding the number of apartments per RCF, the most common range was 30-39 apartments (18.7%), closely followed by 40-49 apartments (18.6%).

In zone 1, access to windows was notably high for the environments where the older adults live. Windows were available in almost all common areas (98.5%), and in dining rooms/living rooms (99.6%). Similarly, all apartments had windows (100%) (dark red bars in Figure 23). For the care worker-specific environments, access to windows

varied. Rest rooms had the lowest access (72.6%), followed by offices (76.8%), conference rooms (88.4%) and care workers' rooms/dining rooms (94.5%) (light red bars in Figure 23).

In Zone 2, all RCFs provided access to entrances that facilitated movement between indoor and outdoor environments. The results also showed that 62.3% of the RCFs had low access to balconies/patios/conservatories for the older adults (Figure 24); for care workers 82,5% of the RCFs lacked such access. Furthermore, only 7.7% of the RCFs had access to greenhouses/orangeries/independent conservatories, and roof terraces were even rarer, only 2.8% had such access.

Access to own gardens on the ground level in direct connection to buildings (zone 3) varied, with only 54.4% of RCFs having such access. However, an additional 41.5% provided access to shared gardens. A small number of RCFs (4.1%) lacked garden access, either because the buildings covered the entire property, or the RCFs were located in zone 4 (Figure 25).

The size of the plots also varied significantly, with a mean size of 25,626 sq m and a median of 10,543 sq m, ranging from 604 sq m to 2,182,316 sq m. Half of the RCFs were situated on plots with a single building (50.6%), followed by those with two buildings (17.0%). While some plot had as many as 41 buildings, the mean value of buildings per plot was 2.9, with a median of 1.0. Additionally, 60.8% of the RCFs had access to one or more open courtyards, and 17.4% featured one or more enclosed courtyards.

In Zone 4, the results showed that RCFs were surrounded by low-rise buildings (65.3%), high-rise buildings (40.7%), high vegetation (81.0%), and open land, such as parks or natural land (73.3%). Some of the RCFs (34.1%) were located near heavy transport infrastructure, and some (34.4%) had access to community features such as health centres, cemeteries, and schools. Within a 300-meter radius of the RCFs, access to public open spaces like parks or cemeteries (95.8%) and public areas with high vegetation (96.6%) was common. However, it was rare for RCFs to have nearby public areas for physical activity (29.3% had access), water contact (32,7% had access), or squares (13.3% had access) (Figure 26).

Swedish RCFs are typically two-floor buildings with access to windows, entrances, balconies, patios, and own or shared gardens. The surroundings are characterized by low-rise buildings and high vegetation. Figure 27 illustrates the results of the access to zones 1-4 structed according to the layout of the zone model.

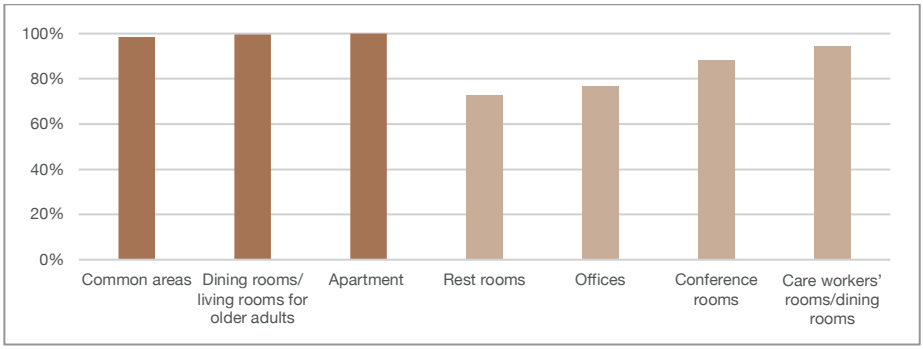


Figure 23. Access to windows in zone 1. Illustration: M. Liljegren

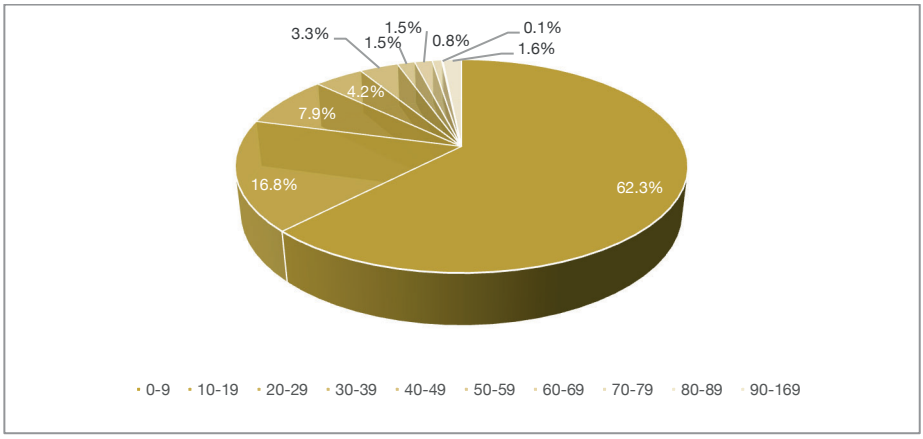


Figure 24. The lowest interval (0-9) for access to balconies/patios/conservatories was the most common, with 62.3% of the RCFs falling within it. Illustration. M. Liljegren

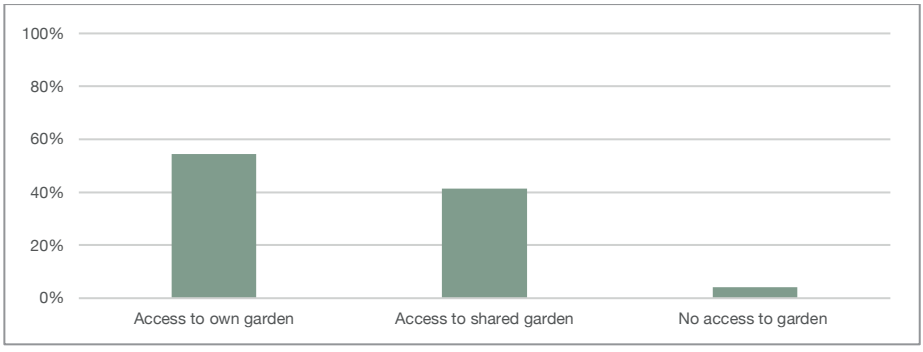


Figure 25. Access to gardens in zone 3. Illustration: M. Liljegren

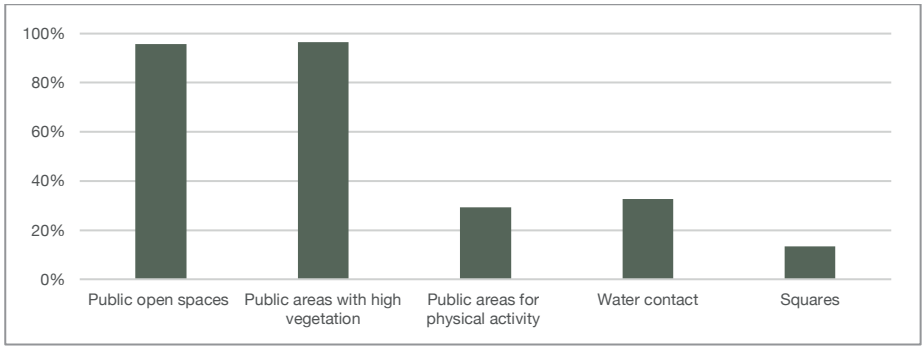


Figure 26. Access to zone 4. Illustration: M. Liljegren

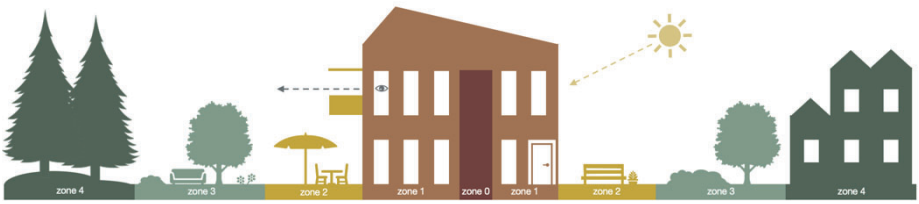


Figure 27. The results of access to zones 1-4 at Swedish RCFs structured according to the layout of the zone model. Illustration: M. Liljegren

To provide accurate information of access to zones 1-4, specific variables were sorted based on the Swedish municipality group classifications, namely 'big cities and municipalities close to big cities' (group 1), 'larger cities and municipalities near larger cities' (group 2), and 'smaller cities/towns and rural municipalities' (group 3). The results showed an even distribution of access to windows in dining rooms/living rooms (99.0%-99.6%). The results of access to balconies/patios/conservatories for older adults showed an even interval distribution between the groups (61.6%-62.9%), while the median for apartments per balcony/patios/conservatory for older adults showed variation (6.8-8.1). Regarding access to own gardens, the results showed variation between the groups. Municipalities categorized as group 2 had the highest access (59.2%), while those of group 1 and 3 had lower access (49.5% and 51.8%, respectively). For access to open areas within a 300-meter radius of RCFs, the results showed consistency across the groups (93.6%-96.6%), as was the case for access to high vegetation (96.3%-97.1%).

To refine the access information to zones 1-4, correlation analyses were carried out. The results of whether zone 2 (access to balconies/patios/conservatories for older adults) could offset the limitations of zone 3 (access to shared gardens or no garden, as opposed to having access to an own garden) indicated a trend. RCFs with numerous balconies/patios/conservatories tended to have higher access to shared or no gardens

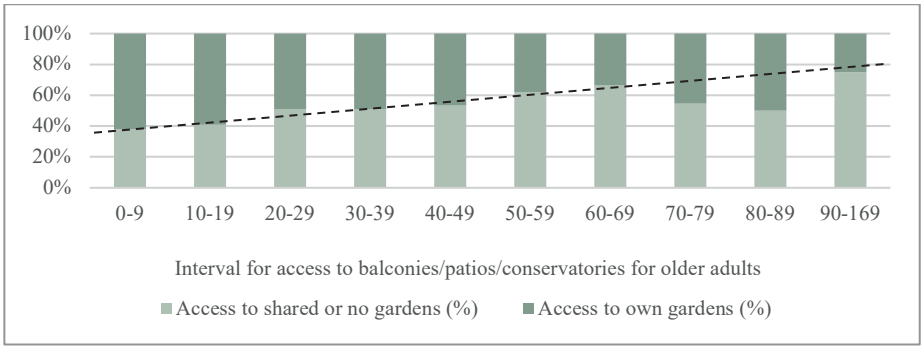


Figure 28. Correlations between RCFs with access to shared or no gardens/own gardens, and access to balconies/patios/conservatories. Illustration: M. Liljegren

compared with those with own gardens. These results indicate that balconies/patios/conservatories seem to compensate the older adults for the absence of own gardens (Figure 28).

The correlation analysis also included median calculations for apartments per balcony/patio/conservatory, as well as calculations of percentages for access to own gardens related to growing zones. The results showed variations for both correlations (5.3-8.3 and 49.1%-60.9%, respectively) (Table 6). These results indicate that growing zones do not seem to affect access to balconies/patios/conservatories or own gardens as there were variations across the country.

Table 6. Correlations of apartments per balcony/patio/conservatory for older adults and growing zones as well as access to own gardens and growing zones

Growing zone	Apartments per balcony/patio/conservatory for older adults (median and in total: 100%)	Own garden (percent and in total: 100%)
I	8.3 (n=270)	58.5% (n=357)
II	5.3 (n=47)	58.9% (n=73)
III	7.1 (n=483)	49.1% (n=697)
IV	6.6 (n=245)	60.4% (n=313)
V	8.0 (n=51)	50.7% (n=71)
VI	6.0 (n=93)	60.9% (n=133)
VII	8.0 (n=186)	52.4% (n=273)
VIII	- (n=0)	- (n=0)
	Median: 7.2 (n=1,375)	**In total:** 54.4% (n=1,917)

Furthermore, the correlation analysis included a calculation of RCFs with access to own gardens related to county division. The reason for reporting results at county level rather than municipal level was to avoid singling out individual municipalities. The results showed variation, as illustrated in Figure 29 (dark green marking indicates a large share of own gardens while light green indicates a small share). The result indicates that geographical location does not eighter seem to affect access to own gardens as variation is noticeable across the country.

When public and private run RCFs are compared, the largest differences apply to:

- *Zone 1:* Access to windows in care-worker-specific rooms varied, such as conference rooms and rest areas, where public RCFs offered greater access compared to private RCFs.
- *Zone 2:* For access to balconies/patios/conservatories for older adults, public RCFs had higher access (interval 0-9: 61.3% for public RCFs respectively 69.5% for private RCFs). Furthermore, it was less common with access to roof terraces at public RCFs compared to private RCFs (1.7% and 7.0%, respectively).
- *Zone 3:* Access to larger plots at public RCFs compared to private RCFs, mean size 26,500 sq m and 21,416 sq m, respectively, and median size 11,693 sq m and 5,787 sq m, respectively. In public RCFs, it was less common to have only one building on a plot compared to on private plots (46.1% respectively 69.7%). Enclosed courtyards were more prevalent in public RCFs, in 20.2% compared to 7.3% in private ones. Furthermore, open courtyards were more common in public RCFs, 64.8% of RCFs compared to 46.9% for private RCFs.
- *Zone 4:* Access to closed buildings was less common for public RCFs compared to private RCFs, with occurrences of 4.3% compared to 12.0%. Similarly, access to high-rise buildings was less frequent in public RCFs (36.5%) than it was in private RCFs (56.4%). In contrast, public RCFs had higher access to low-rise buildings (66.9% compared to 59.2%), sparse buildings (20.4% compared to 10.7%), and cropland (12.4% compared to 7.3%). Additionally, access to living area squares was less common in public RCFs (11.4%) compared to private RCFs (20.9%).

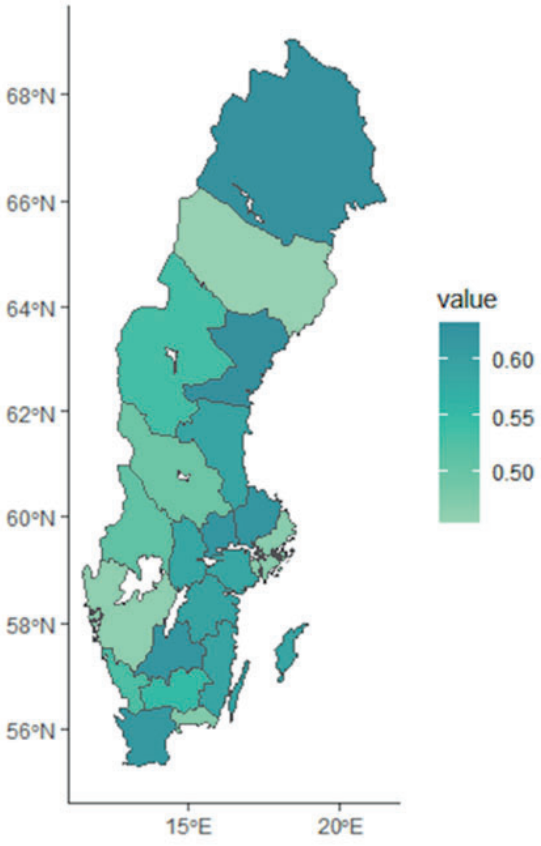


Figure 29. RCFs with access to own gardens related to county division. Illustration: The external statistician

DISCUSSION

DISCUSSION

The studies in this thesis contribute new knowledge on needs and wishes of older adults and care workers in contact with outdoor environments at RCFs. They also contribute with a process for mapping access to these environments as well as a complete national survey of access to outdoor environments at Swedish RCFs. In this chapter, the results are discussed related to previous research and the theoretical perspectives used. Methodological considerations are also addressed, outlining the positions taken throughout the studies. Finally, interdisciplinary research is discussed.

DISCUSSION OF RESULTS

The results from Papers I-IV confirm previous research on the importance of contact with nature and outdoor stays as a basic human need as well as on the positive health-support associated with contact with nature through windows, outdoor stays, and outdoor work. Furthermore, the results extend previous research by contributing insights into older adults and care workers needs and wishes in contact with the outdoor environments, into the role of outdoor environments as living environments and as arenas for person-centred care and rehabilitation. Additionally, the results contribute further knowledge about potential health factor for care workers. The research also contributes a mapping process for access to the outdoor environments, and thereby a complement to existing EBD tools. Moreover, the research provides valuable new knowledge about access to outdoor environments at Swedish RCFs on a national level.

This section discusses the results related to outdoor environments from three perspectives: as underutilized resources for health; as potential to serve as significant living environments in age-friendly cities and societies; and as potential work environments for person-centred care and rehabilitation. Furthermore, this section also discusses evidence-based approaches for designing outdoor environments and decision-making in care and rehabilitation outdoors. The section concludes with reflections on the generalizability of the results.

OUTDOOR ENVIRONMENTS AS AN UNDERUTILIZED RESOURCE FOR HEALTH

The first perspective, outdoor environments as an underutilized health resource, is based on the older adults' insights on their prior experiences using outdoor environments during their time in their ordinary homes, which also aligns with previous research (Vilhelmson & Thulin, 2022). The older adults noted that outdoor environments remained important to them even when living at RCFs. Those who were

independent and could choose to spend time outdoors when they wished considered themselves privileged, highlighting how highly the opportunity to access these environments was valued. In contrast, those who experienced isolation indoors due to disabilities and a lack of personal support expressed that outdoor stays were what they missed the most after moving to RCFs. These results aligned with their care workers' reflections in that the care workers saw the potential of outdoor environments for health as meeting a basic human need. In previous literature, basic physical human needs are well-documented (Maslow, 1954; Zhang et al., 2022), and when applied to older adults at RCFs, these needs refer, for example, to access to food, water, sleep, hygiene support, and toilet visits. The results from Paper II expand upon this by adding contact with nature and outdoor stays as essential aspects of these basic needs. The care workers experiences also indicated that outdoor stays contributed to increased energy and well-being for both themselves and the older adults.

Given that RCFs are often the last homes older adults move to, it is crucial to ensure that this final phase of life is as dignified as possible. Since the older adults interviewed expressed a desire to use the outdoor environments as part of their everyday life, it is important to respect their wishes and to strive to meet their needs. From a care workers' perspective, this means attempting to reverse the negative trends of high workloads and stress, which lead to high sick-leave rates and challenges in recruiting and retaining personnel. Previous research highlights that it is insufficient to focus solely on risk factors; health-promoting factors must also be central (Choi et al., 2012; Lövenmark & Hammar, 2024; Svartengren et al., 2013; The Swedish Agency for Work Environment Expertise, 2023; The Swedish Institute of Stress Medicine, 2021). Results from Paper II showed that care workers themselves recognize the potential of outdoor environments as a health-promoting resource. The results also revealed considerable variation between professional groups regarding attitudes and awareness of the outdoor environments. These results are consistent with findings from the annual national survey of RCFs (The Swedish National Board of Health and Welfare, 2024c). For example, 92% of RCF operators reported lacking a routines for how outdoor environments should be included into planned care and rehabilitation. The absence of such routines underscores that older adults who require personal support for outdoor stays likely do not receive it to the extent they wish. As a result, their needs for contact with nature and outdoor stays are unmet, depriving them of the positive health benefits that contact with nature and outdoor stays offer. Furthermore, the results from Paper IV showed that care workers had limited access to zone 1, and that access to own outdoor environments in zone 2 for use during breaks was low. This restricts their possibilities of benefiting from the health-promoting effects of outdoor environments (Cordoza et al., 2018).

On one hand, there are the positive health effects of outdoor stays for older adults, and on the other hand, it is important to remember that the absence can lead to negative health consequences, such as reduced well-being and disappointment (Dahlkvist et al., 2019). Therefore, it is crucial to ensure that all older adults can access outdoor environments. Non-independent older adults expressed a wish for year-round daily

outdoor stays, and care workers also described a need for year-round outdoor stays. These needs and wishes should be considered in relation to the time recommendations for positive health effects from outdoor stays. The general recommendation is at least two hours per week (White et al., 2019), and for older adults with dementia, it has been reported that benefits for both the older adults and their care workers can be achieved with 30 minutes of outdoor stays per day (van der Velde-van Buuringen et al., 2021). However, it is important to highlight that this is not about forcing older adults to be outdoors, but rather about offering outdoor environments as places for health enhancement. If outdoor stays are not possible, benefits of contact with nature can still be obtained for older adults (Yeo et al., 2020) and care workers (Evensen et al., 2017) by bringing natural elements and plants into the buildings.

The zone model (Bengtsson, 2015) helped interpret the results concerning the health-promoting importance of nature contact and outdoor stays by highlighting needs and wishes related to all four zones and body positions/functional capacities. The ecological model (Lawton, 1983; Lawton & Nahemow, 1973; Lawton & Simon, 1968) further helped interpret the results by illustrating that as individual competence (health) declines, the environmental pressure needs to adjust accordingly in order for older adults to maintain adequate behaviours and continue using and benefiting from outdoor environments. Alternatively, the personal support from care workers must increase to compensate for this decline.

OUTDOOR ENVIRONMENTS AS SIGNIFICANT LIVING ENVIRONMENTS IN AGE-FRIENDLY CITIES AND COMMUNITIES

The second perspective, outdoor environments as living environments in age-friendly cities and communities, is based on the reflections of older adults and care workers concerning the uses of zones 1-4. For example, the older adults expressed wishes to include the outdoor environments into their daily social interaction as well as for private moments, meals, exercise, activities, and rest. These results align with the goals of age-friendly cities and communities as they show that older adults wish to remain active participants of society (World Health Organization, 2024). For outdoor environments to function as living environments, they must be physically accessible and adapted to the diverse physical and cognitive needs of older adults (Ankre & Wall-Reinius, 2024), for example, designed in such a way that the transition points are as few as possible. Failing to ensure this access likely excludes older adults from interacting with society, and as a result, they risk becoming invisible in the societal landscape. Denying older adults the opportunity to take their place and participate in decision-making concerning issues related to them, such as the design of age-friendly living environments, can be seen as ‘ageism’, which refers to ‘the stereotypes (how we think), prejudices (how we feel), and discrimination (how we act) towards others or oneself based on age’ (The Swedish Institute for Human Rights, 2024; World Health Organization, 2021a).

This second perspective can also be linked to the older adult’s self-identity and the sense of home of RCFs. Self-identity is shaped by life experiences and relationships

we have, which define who we are (Linde, 1993; Randall, 2014). Moving into an RCF can significantly affect older adults' self-identity as place-relationships change (Dennerstein et al., 2018). Identity research suggests that some older adults define nature as an integral part of their self-identity (Husser et al., 2020), highlighting the interplay between self-identity and contact with nature. This interplay can be linked to the concept of place attachment, which refers to a positive bond between a person and the environment, including the interaction between affection and emotion, knowledge and trust, behaviour and actions related to place (Altman & Low, 1992; Clark et al., 2024). Place attachment is also, as stated by Phenice & Griffore (2013), fundamental to one's self-definition, described as an anchor to one's identity and to a time or culture that may no longer exist.

Attachment to place is further believed to create a sense of home and can help preserve self-identity in older adults when they move to RCFs (Falk et al., 2013). The results of Paper I showed that having gardens with flowers and berries at RCFs strengthened a feeling of 'coming home' after visits to the surroundings. The feeling of being home can also be built up through reconnecting to familiar outdoor environments (Tsai et al., 2020). These examples indicate the importance of giving older adults the opportunity to explore and become familiar with the new outdoor environments at RCFs, allowing them to reconnect on a regular basis, thus, supporting their sense of home. Previous research has also shown that gardens and other outdoor environments integral to RCFs strengthen a sense of life's continuity and a person's self-identity. It was also found that the more time spent in a place, the stronger becomes the attachment (Motalebi et al., 2023; Newton et al., 2021). The above findings also apply to older adults and enhances understanding of 'aging in place' as noted by Lebrusán & Gómez (2022). This conception aligns with meeting older adults' needs and supporting them in their attempts to live as independently as possible for as long as possible (Horner & Boldy, 2008; Pani-Harreman et al., 2021).

Along with the concept of place attachment, place identity is another concept that refers to the bond between person and place. Place identity refers to the part of self-identity that is shaped by emotions and meanings assigned to a place; what it symbolizes to a person (Reese et al., 2019). Thus, in assuming that having a place to call home is essential (Peng et al., 2020) along with the self-identity and contact with nature it entails, it is then important to foster these feelings when older adults transition to RCFs. Doing so could strengthen their place attachment and place identity, helping them build stronger connections with their new environment. Therefore, it is crucial to view outdoor environments as integral aspects of living environments in age-friendly cities and communities as they support the older adults in developing their self-identity as residents of RCFs and of the RCFs as their new homes.

From this perspective, the zone model (Bengtsson, 2015) helped interpret the results, particularly regarding the importance of ensuring access to outdoor environments at RCFs as part of age-friendly cities and communities. Such access is essential for supporting older adults in developing their self-identity and sense of home.

Unfortunately, the results from Paper IV showed that access to outdoor environments, especially in zones 2 and 3, were lacking, which can be seen as hindering age-friendly development. The zone model also helped to highlight that there were variations in access between public and private operators, as well as across different municipal groups. This awareness is crucial to counteract inequalities. Similar to how the ecological model (Lawton, 1983; Lawton & Nahemow, 1973; Lawton & Simon, 1968) helped interpret the results concerning outdoor environments as an underutilized health resource, it also clarified the importance of adapted outdoor environments at RCFs and within age-friendly cities and communities.

OUTDOOR ENVIRONMENTS AS WORK ENVIRONMENTS FOR PERSON-CENTRED CARE AND REHABILITATION

The third perspective, outdoor environments as work environments for person-centred care and rehabilitation, is based on the expressed need of care workers to spend time outdoors all year round (Paper II). This is further supported by previous research on the positive health effects of outdoor stays together with older adults (van der Velde-van Buuringen et al., 2021) and outdoor work (Petersson Troije et al., 2021). Additionally, there is a clear need to develop factors that promote health and well-being among care workers (Svartengren et al., 2013; The Swedish Agency for Work Environment Expertise, 2023; The Swedish Institute of Stress Medicine, 2021), with outdoor care and rehabilitation being recognized as having significant potential in this regard. The fact that 92% of the Swedish operators at RCFs lack a routine for care and rehabilitation outdoor coupled with the inadequate conditions of outdoor environments (The Swedish National Board of Health and Welfare, 2024b, 2024c) and lack of access (Paper IV), highlights the urgent need for both operational practices and outdoor environments to be developed. National and local policymakers in collaboration with representatives from authorities, RCF managers, and researchers need to take the lead and show the way out (Nordin, Liljegren, et al., 2024) to deal with the operational challenges identified by the care workers in Paper II.

Furthermore, the attitude towards outdoor interventions needs to change, shifting from viewing them as not ‘real work’ and that they are failing their colleagues who are working indoors (Jacobsen et al., 2023), to an approach that recognizes that person-centred care and rehabilitation can be carried out both indoors and outdoors. In addition, working in outdoor environments should not be seen as an additional task; instead, it involves re-prioritizing and including regular tasks being carried out outdoors some of the time (van der Velde-van Buuringen et al., 2021). To support this view, previous research has shown that implementation of person-centred interventions has been facilitated when healthcare organizations focus on supporting care workers through collaborative structures and resources such as time, space, and personnel (Gustavsson et al., 2023). Additionally, the corresponding square meter recommendation for access to outdoor environments in preschool and schoolyards (The Swedish National Board of Housing Building and Planning, 2021) should be developed for RCFs to enable access and work in own gardens at ground level. This

aspect is of importance as having access to own gardens is linked to improved health and well-being (de Bell et al., 2020; Xu et al., 2023), and provides the physical conditions for person-centred care and rehabilitation in zone 3.

To align with the Swedish National Board of Health and Welfare's (2024a) outdoor environment indicators, a routine for person-centred care and rehabilitation outdoors should outline a plan for ensuring access to outdoor environments. It should also define roles and responsibilities for planning and implementing, and address the need for specific competencies. Furthermore, the routine should also specify equipment and work clothes for outdoor use, daily maintenance of the outdoor environments (bringing out cushions, cleaning tables etc.), and more extensive maintenance (grass cutting, hedge trimming etc.). Additionally, person-centred care and rehabilitation outdoors should be included in workplace meetings to foster participation among the care workers. Finally, just as indoor environments are part of the strategic work environment at RCFs, so should outdoor environments be integrated into this planning to ensure safe conditions for the care workers.

In practice, care and rehabilitation outdoors can be introduced by scheduling both social care workers and healthcare workers to work in outdoor environments during parts of their shifts. From the perspective of older adults, this means that the care and rehabilitation interventions documented by the care workers in care and rehabilitation plans should be reviewed and clarified to specify whether they are to be carried out indoors and/or outdoors. Furthermore, in the development of person-centred care and rehabilitation outdoors as well as that of the outdoor environments, it is essential to include the older adults in order to combat and reduce ageism (World Health Organization, 2021b). Previous research has shown that the opinions of older adults are often overlooked in the planning of interventions, undermining their rights to influence decisions (Sjögren Forss, 2020).

The person-centred practice framework (McCance & McCormack, 2021) helped to interpret the results in terms of the physical outdoor environment as part of the practical environment where care and rehabilitation is offered and carried out. The results of Paper II show that care workers have varying levels of experience in using zones 1-4 as environments for person-centred interventions. However, with the increased awareness of the importance of the outdoor environments for both their own health and well-being and that of older adults generated in the focus group interviews, the care workers' attitudes toward these environments seemed to become more positive. Additionally, the zone model (Bengtsson, 2015) helped interpret the results by highlighting that all four zones needed to be accessible for person-centred care and rehabilitation.

EVIDENCE-BASED APPROACHES FOR DESIGNING OUTDOOR ENVIRONMENTS AND MAKING DECISIONS FOR PERSON-CENTRED CARE AND REHABILITATION OUTDOORS

The perspective of evidence-based approaches highlights the importance of combining EBD (Hamilton & Watkins, 2009) with EBP (Pistone et al., 2022), which is consistent with prior research (Bil et al., 2017). Doing so, increases the possibilities to fully realize the potential of outdoor environments at RCFs as health resources, living environments, and work environments. The quote, 'If you plan a city for cars and traffic, you get cars and traffic. If you plan for people and places, you get people and places' (Kent, 2008), delivers a clear message. When applied to the context of this thesis, the formulation becomes: 'If you plan for adapted indoor environments and person-centred care and rehabilitation indoors, you get older adults and care workers indoors. If you plan for adapted outdoor environments and person-centred care and rehabilitation outdoors, you get older adults and care workers outdoors.' As simple as this statement may seem, the reality is a somewhat more complex. The design of indoor and outdoor environments along with the planning of person-centred care and rehabilitation interventions in both need to be developed in a coordinated and strategic manner. Although there may be uncertainty regarding how allocated land in cities and communities should be designed to promote health and well-being (Sunding et al., 2024), the outdoor environments at RCFs should be based on the 19 health-promoting design qualities outlined in QET (Bengtsson, 2015; Bengtsson et al., 2022; Nordregio, 2024), the S-SCEAM (Nordin et al., 2015), the SOS Tool (Bardenhagen et al., 2018; Rodiek et al., 2016), and Housing Enabler (Iwarsson et al., 2012). These instruments can also be complemented by the supportive and hindering environmental aspects presented for each zone and transition in Papers I and II. Furthermore, it may be beneficial to base the design of the outdoor environments on a value framework, such as the person-centred practice framework. In practice, this could mean that the framework serves as the foundation for design decisions throughout the entire design process. The use of this framework would ensure that care and rehabilitation is provided under good conditions concerning the physical environment. It may also be beneficial to use knowledge of universal design, which means designing with human diversity in mind. The goal is to create physical environments that are inclusive for all persons, regardless of their abilities (Erdtman, 2024). Regarding decision-making for care and rehabilitation (EBP), the results of Papers I and II show that both older adults and care workers want to use the outdoor environments. Furthermore, since neither the Patient Safety Act nor the Health and Medical Services Act specify what healthcare environments should be used for care and rehabilitation (The Swedish Government, 2010b, 2017), there is no conflict in using outdoor environments.

Challenges in planning healthcare buildings include how these can meet physical, functional, technical, economic, social, and legal demands throughout their lifespan. This highlights the importance of future-proofing and preparing buildings for upcoming changes (Karlsson, 2019). A similar approach should be applied to the design of outdoor environments at RCFs and in age-friendly cities and communities,

with a particular emphasis on adaptions to ongoing climate changes, including heatwaves. Such changes are expected to have a negative impact on well-being, with older adults being especially vulnerable (Cissé et al., 2022). For example, the 3-30-300 rule could be applied as a nature-based solution to improve health and well-being (Browning et al., 2024; Konijnendijk, 2023; Nieuwenhuijsen et al., 2022; United Nations Economic Commission for Europe, 2022) as urban greenery and proximity to parks ensure comfortable outdoor stays for older adults even during heatwaves (Lönn et al., 2025). To support this work, specific quality criteria for nature-based solution in healthcare facilities can be applied (Sterckx et al., 2023).

From this perspective, the person-centred practice framework (McCance & McCormack, 2021), the ecological model (Lawton, 1983; Lawton & Nahemow, 1973; Lawton & Simon, 1968), the zone model, and the QET (Bengtsson, 2015) helped interpret the results in terms of the importance of access to outdoor environments with high design qualities. The outdoor environments create the conditions necessary for person-centred care and rehabilitation outdoors in combination with the decision-making of operators how to use these environments for interventions.

GENERALIZABILITY OF RESULTS

The walking interviews and mapping of access to outdoor environments were conducted within the Swedish context, which means that the results of this thesis may not fully reflect conditions in other countries. The relatively small sample of older adults (Study I) and care workers (Study II) is another aspect to consider when discussing the generalizability of the results. Since the mapping is based on a total survey, the results reflect access to outdoor environments in Swedish RCFs at the national level (Studies III and IV), meaning no national generalizations are necessary. Furthermore, the results from the mapping should not be generalized to other countries as regulations regarding access to windows, balconies, etc., may vary, as well as the availability of plots that allow for gardens. However, the matrix and manual could potentially be used to map access to outdoor environments at RCF in other countries and in other healthcare contexts.

METHODOLOGICAL CONSIDERATIONS

This thesis includes interviews with twelve older adults, eleven care workers, and data from over 2,000 RCFs. The four studies employ a multi-method design to address the varied aims (Anguera et al., 2018). This approach is useful for studying older adults, person-centeredness, and physical environments at RCFs (Wijk, 2020). Previous research has highlighted that combining methods decreases limitations and weaknesses (Creswell & Plano Clark, 2011). Furthermore, the design and methods employed warrant a critical discussion. This section discusses methodological considerations for both the qualitative and quantitative approaches, followed by reflections on interdisciplinary research.

METHODOLOGICAL CONSIDERATIONS CONCERNING THE QUALITATIVE APPROACH

The qualitative methods in Studies I and II, individual semi-structured walking interviews with the older adults and semi-structured walking interviews as focus groups with the care workers (Halkier, 2017; King & Woodroffe, 2019), generated rich data. The research team followed COREQ guidelines (Tong et al., 2007) for transparent reporting of design, analysis, and results. The selection of municipalities, RCFs, and participants ensured diverse perspectives, reflecting various locations, buildings, body positions, and professions, fulfilling the goals of capturing diverse experiences in outdoor environments.

A strength of the method was its adaptability, allowing walking interviews that considered diverse conditions and could be tailored to the older adults' specific needs. These interviews also provided opportunities to observe the older adults' interactions with outdoor environments, leading to valuable insights and follow-up questions. Despite health conditions, most older adults appeared to have experienced the interviews positively. This aspect aligns with previous studies, which have shown that older adults often value the opportunity to reflect on and share their experiences in research (Boström, 2014; Nordin, 2016). The care workers' insights were crucial, given their practice-based knowledge of older adults' needs and wishes in contact with the outdoor environments. The dynamics between the care workers in the focus groups evolved from some initial unawareness and scepticism to recognizing the benefits of these environments, which reinforces the method's value in generating reflections. Data were collected within a short timeframe in the spring of 2022 to maintain consistency.

A critical reflection, however, concerns the fact that none of the older adults expressed negative opinions about outdoor stays likely because only those with positive attitudes participated, which may have limited perspectives. Study I also excluded the frailest older adults, such as those who were bedridden or with dementia, which may also be seen as a weakness. Additionally, the absence of relatives, operations developers, and property managers, whose insights would have been valuable, is a limitation.

Conducting the interviews based on my professional background and experience allowed me to relate to the older adults, care workers, and the environment design despite not having previously met the participants or worked at the RCFs. My experiences working with older adults and collaborating with care workers helped with shared terminology. In my view, conducting the interviews was interesting and well within my comfort zone.

Credibility is considered the most important aspect of qualitative research, referring to confidence in the truthfulness of the data and the accuracy of its interpretation (Polit & Beck, 2021). To ensure credibility in Studies I and II, data analysis was conducted collaboratively by the research group to minimize bias. In Study I, qualitative content analysis was employed (Graneheim et al., 2017; Graneheim & Lundman, 2004; Lindgren et al., 2020), while in Study II, thematic analysis was used to explore the data

(Braun & Clarke, 2014; Clarke & Braun, 2017). Although both methods involve inductive and deductive interpretation, the main difference is the potential to quantify data (Vaismoradi et al., 2013). The decision to use both approaches was based on their respective suitability for the research context (Braun & Clarke, 2006; Green & Thorogood, 2014). Credibility was further supported by data richness and sample size, with Study I relying on assessment of data saturation and Study II on information power. Data saturation indicates when no new information emerges (Polit & Beck, 2021), but since it does not philosophically or methodologically align with thematic analysis, Braun and Clarke (2022) recommend using information power to determine sample size. This concept takes into account the researcher's reflections on the study's aims, the application of established theory, sample specificity, the quality of dialogue, and the analysis strategy (Malterud et al., 2016). Conclusions on both saturation and information power were reached collectively by the research group, which included researchers with extensive experience in qualitative approaches.

Confirmability refers to objectivity and concerns the accuracy, relevance or meaning of the data (Polit & Beck, 2021). To ensure confirmability, the researchers grounded categories/themes and sub-categories/sub-themes directly in the data, supported by illustrative quotations. Transferability refers to the applicability of results to other settings or groups (Polit & Beck, 2021). The characteristics of the three municipalities, three RCFs, twelve older adults, and eleven care workers were thoroughly described to provide the reader with adequate information. The zone model analysis used in both studies effectively structured supportive and hindering environmental aspects within each zone, as well as the transitions between these (Bengtsson, 2015).

A weakness of the studies was the seasonal focus as data were only collected in the spring, which may have influenced participants' perceptions due to varying weather conditions throughout the year.

METHODOLOGICAL CONSIDERATIONS CONCERNING THE QUANTITATIVE APPROACH

The zone model (Bengtsson, 2015) provided the theoretical basis for Studies III and IV, offering a structured approach to categorize physical environmental aspects into zones 1-4. The mapping process led to the creation of the matrix and manual (Study III), which were used to map access in Study IV.

Initially, there was an idea of the steps included in the mapping process, which was refined over time. The final version included ten steps, each clearly described for implementation. The matrix variables were selected based on research into health-promoting aspects of physical environments and the expertise of the interdisciplinary research group, ensuring diverse perspectives on older adults' and care workers' contacts with outdoor environments. The process of analysis the first 200 RCFs before proceeding with the rest was valuable in developing the matrix and manual, leading to a final versions which serves as a step toward creating an evidence-based tool for mapping access to zones 1-4.

For mapping access to zones 1 and 2, the research group chose architectural drawings rather than field visits as the pilot study showed the drawings were sufficient to identify physical environmental aspects like windows and balconies. However, mapping access to patios was challenging as some drawings indicated doors to patios but did not confirm whether the patios existed outdoors. For zone 3, the research group initially planned to use architectural drawings and basic online map services to map access to gardens and courtyards but the pilot study showed these were unreliable. Consequently, the research group switched to using more advanced online mapping services which provided higher-quality data.

Similarly, for zone 4, basic online map services were initially used but replaced by advanced services for improved data quality. This choice provided the desired level of data. Most municipal building permit units (90.3%) provided drawings, covering most RCFs and data extraction of zones 1 and 2 (88.9%). Online maps for data extraction in zones 3 and 4 covered 94.2%-98.1% of RCFs, confirming the method's appropriateness.

The matrix and manual offered several strengths, such as providing a clear structure for data collection and guidance in the process. However, it also had some weaknesses, particularly the significant time required for data collection and extraction. Another weakness was that only window access was mapped, which does not provide insights into the availability of views of nature. A major difficulty was the inconsistent quality of architectural drawings. Furthermore, in some cases, the building permit units lacked complete drawings while others imposed fees for accessing the public documents. Discrepancies between RCF addresses and Swedish land registry data also required time-consuming corrections. For zones 3 and 4, a further challenge arose when the digital maps lacked the resolution needed to accurately measure the outdoor environments. Moreover, some RCFs were located on public land, which added complexity to the mapping process. Random checks revealed deviations, especially for patio access and land area due to poor drawing quality or aerial image resolution. Additionally, since the property boundaries in the Swedish land survey's mapping data are not legally binding, the results for land area need to be considered as indicative rather than precise.

Reliability and validity are important quality criteria in quantitative research (Polit & Beck, 2021). To improve the mapping quality, the matrix should be transformed into an evidence-based tool through reliability and validity testing. A test-retest analysis could assess the absence of measurement errors (reliability), while content validity testing would ensure the variables measure what they are intended to (validity). Calculating the content validity index and ratio as well as involving an expert panel would further strengthen the tool (Streiner & Norman, 2014). The manual should be adapted into a user-friendly guide for practitioners, meaning that once completed, both the matrix and the manual will be valuable resources for both national and international researchers studying accesses to outdoor environments. In Studies III and IV, the random checks and manual ensured quality control and improved reliability. Further

assurance was provided through consultation with an external statistician, who provided advice on the matrix design, the feasibility of coding data as numbers, and who supported statistical calculations.

Some current variables could be refined and new ones added to provide a more comprehensive description of access to outdoor environments. For example, zone 1 variables could be broken down further, and zone 2 could include measurements of balconies, patios, and conservatories to assess how many older adults and care workers can use these places at the same time. Zone 3 could include a variable for elevator access from wards directly to gardens. Converting qualitative design qualities from the QET (Bengtsson, 2015) into quantitative variables could also improve the tool. Additionally, applying the 3-30-300 rule could be useful by considering the 300-meter radius to public green spaces, visibility of at least three trees from windows and workrooms, and RCFs being in areas with at least 30% tree canopy coverage (Browning et al., 2024; Konijnendijk, 2023).

Data were analysed using descriptive statistics and correlation analysis (Norman & Streiner, 2008). Descriptive statistics provided insights into zone access and allowed comparisons between Swedish municipal group classifications and public versus private operators. Correlation analysis identified relationships between variables, leading to increased insights concerning the access.

INTERDISCIPLINARY RESEARCH

Interdisciplinary research has been described as ‘a mode of research by teams or individuals that integrates information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines or bodies of specialized knowledge to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline or field of research practice’ (National Academy of Sciences, 2005). As the description indicates, Studies I-IV included theories and methods from three disciplines to address outdoor environment challenges that no single discipline could tackle alone to reach comprehensive results.

Adopting an interdisciplinary approach to researching person-environment interactions at RCFs is not new (Alves et al., 2024; Xie & Yuan, 2022). The chosen theoretical perspectives and methods were well-suited for this approach. For example, the zone model has been used in interdisciplinary research (Oher et al., 2024) and collaborative contexts (Bengtsson et al., 2018; Nordregio, 2024), and walking interviews are suitable for exploring person-environment interactions from an interdisciplinary perspective (King & Woodroffe, 2019).

Furthermore, there is value in reflecting on the interdisciplinary way of working employed here to explain how the studies were practically conducted. The participants in the research group were based in two different geographical locations in Sweden, which has meant that most of the collaborative work has taken place digitally through regular meetings and email communication. Tasks have been collectively identified, discussed, and decisions made, after which they have been distributed and executed.

During subsequent meetings, updates were shared, and new tasks distributed. I was the first author of all four papers, which means my role has been to lead the execution of the studies and the writing of the papers.

Previous research emphasizes the importance of mutual respect, engagement, and listening for successful interdisciplinary collaboration (Lynch, 2006). These aspects were present in the four studies, contributing to a positive experience. A strength was integrating perspectives from different disciplines, leading to a more comprehensive understanding (Keys et al., 2017) and promoted the development of a new interdisciplinary research field (National Academy of Sciences, 2005). This field encompasses healthcare sciences, architecture, and landscape architecture/ environmental psychology. A weakness, however, was the additional time needed to explain and consider each researcher's viewpoint before decision-making.

Another aspect of the way of working was the formation of a reference group, including 18 stakeholders. The group represented senior citizen associations, experts, authorities, companies involved in designing, planning, developing, constructing, and managing physical environments at RCFs, trade unions focused on care and rehabilitation from the care workers' perspective, a municipality running RCFs, and the academia. The aim of the group was to facilitate knowledge exchange, experience sharing, and networking. Meeting digitally twice a year allowed participants from across the country to join in a convenient and cost-effective way. An advantage was that the research group could ask targeted questions, gaining real-world insights. Another benefit was the direct dissemination of results, speeding up implementation.

CONCLUSION

CONCLUSION

This thesis addresses a societal challenge by focusing on outdoor environments for older adults and care workers at RCFs concerning needs, wishes, and access. The results contribute new knowledge that addresses identified knowledge limitations i.e. concerning the needs and wishes of older adults in relation to outdoor environments at RCFs, how these environments can be used as arenas for person-centred care and rehabilitation, a lack of evidence-based tools to assess quantitative access to outdoor environments at RCFs, and a knowledge lack of actual access to outdoor environments at Swedish RCFs at the national level.

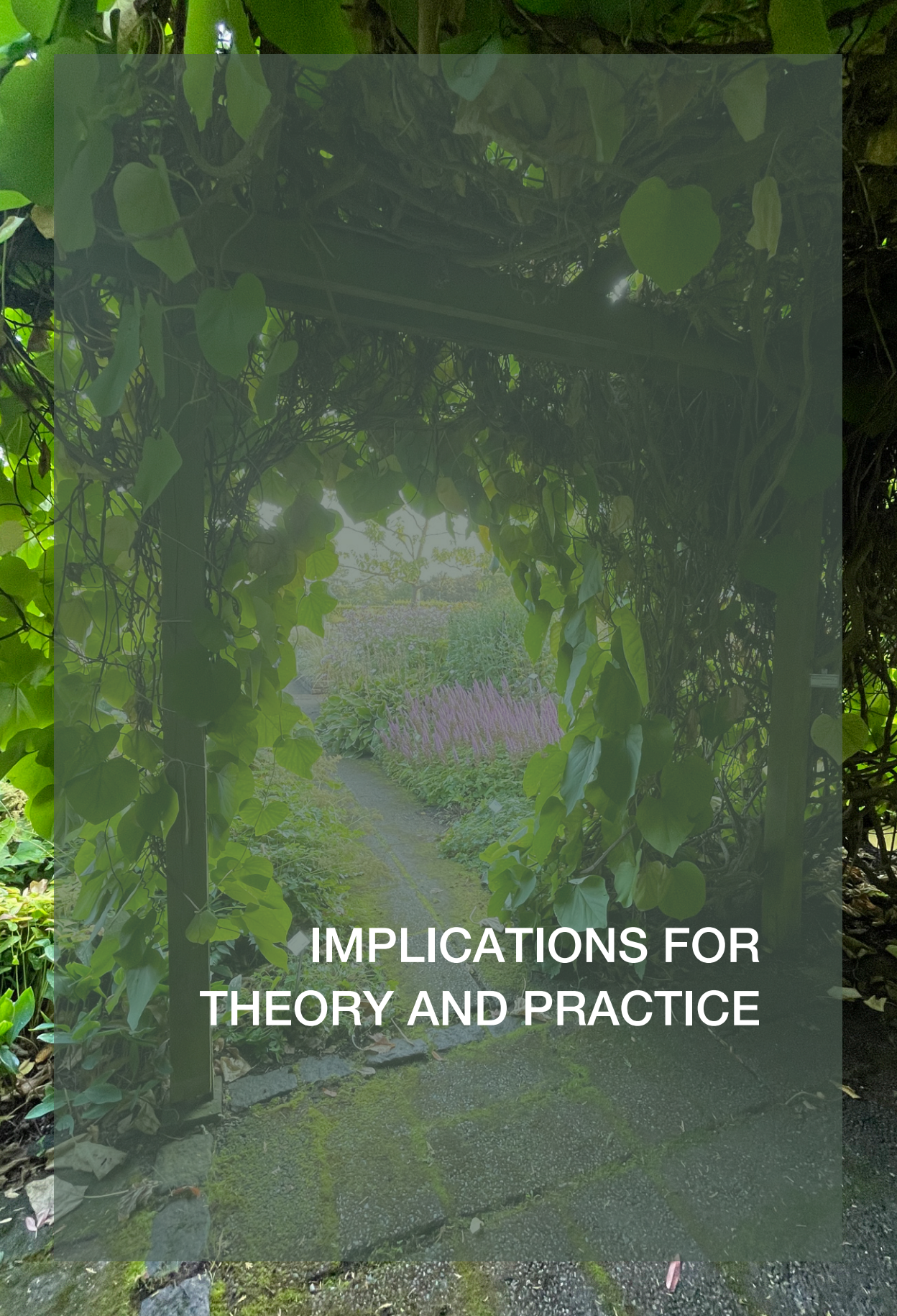
The results show that both older adults and care workers acknowledged the value of using the outdoor environments as everyday environments and arenas for person-centred care and rehabilitation, recognizing their positive impact on health. However, the results also showed that access to these environments is limited at the national level.

On an overall level, the outdoor environments:

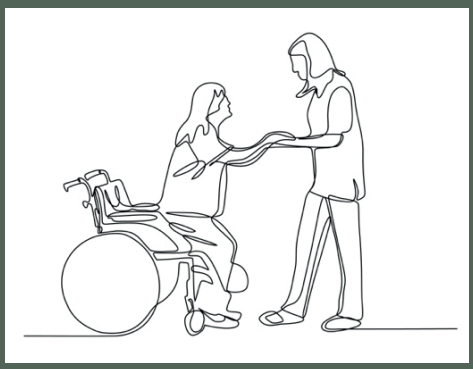
- Are an underutilized health-promoting resource for older adults and care workers at Swedish RCFs.
- Have the potential to serve as significant living environments in age-friendly cities and communities.
- Have the potential as work environments for person-centred care and rehabilitation.

To harness outdoor environments as health-promoting resources and unlock their potential as living and work environments, evidence-based approaches for designing outdoor environments and making decisions regarding person-centred care and rehabilitation outdoors should be applied.

However, one important question remains: What will the results be used for? In the next section, both theoretical and practical implications are presented.



IMPLICATIONS FOR THEORY AND PRACTICE



IMPLICATIONS FOR THEORY AND PRACTICE

The results presented in Papers I-IV gain meaning only if they are placed in relevant contexts. This chapter presents implications for theory and practice related to outdoor environments for older adults and care workers at RCFs. First, theoretical implications are presented, followed by practical implications. Finally, a synthesis of both is provided in terms of two guiding rules highlighting access to outdoor environments at RCFs

THEORETICAL IMPLICATIONS

The theoretical perspectives of this thesis draws on nursing science in terms of the person-centred practical framework (McCormack et al., 2008; McCormack & McCance, 2006), on gerontological science in terms of the ecological model (Lawton, 1983; Lawton & Nahemow, 1973; Lawton & Simon, 1968), and on landscape architecture/environmental psychology in terms of the zone model (Bengtsson, 2015). Nursing science and gerontological science are encompassed within the broader field of healthcare science of older adults.

As previously mentioned, this thesis is at the intersection of healthcare science, architecture, and landscape architecture/environmental psychology. It offers theoretical implications into the person-environment interaction with relevance across the three disciplines. Specifically, in healthcare sciences, this interaction focuses on the relationship between person (older adult and care worker) and the indoor and outdoor environments at RCFs, where the care and rehabilitation take place. In architecture, the focus shifts to the relation between person and RCF building in terms of access to windows, doors, and balconies. Furthermore, in landscape architecture/ environmental psychology, the attention moves to the relationship between person and outdoor environment at RCFs, such as access to patios, gardens, and surroundings (Figure 30).

The theoretical implications are presented in concretely, outlining how the theoretical perspectives employed in the studies are shaped by the results from Papers I-IV in combination with previous research. In the theoretical framework, the person-centred practice framework was presented as serving as overarching philosophy of care in the thesis. This was followed by the two models: the ecological model and the zone model. Lastly, QET was presented, transitioning from the more general to the more specific. In this section, the theoretical implications are presented in reverse order. By the end of the current section, the developed implications are integrated into the person-centred practice framework, thereby bringing it full circle.

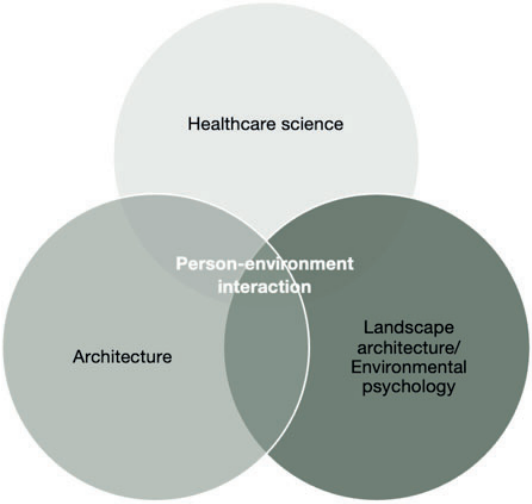


Figure 30. Person-environment interaction based on the disciplines of healthcare science, architecture, and landscape architecture/environmental psychology. Illustration: M. Liljegren

DEVELOPMENT OF THE ZONE MODEL

The original zone model outlines four different zones in contact with the outdoor environment in healthcare settings, from inside the building (zone 1) to further outdoors (zone 2-4). Additionally, rooms without contact are included in the model (zone 0) (Bengtsson, 2015). Based on the results from Papers I and II and previous research on outdoor environments in healthcare settings (Bengtsson & Lavesson, 2024), zones 1-4 have the potential to serve as health-promoting resources for both older adults and care workers at RCFs. Therefore, it is essential to relate the results for each zone and provide specific descriptions in the context of RCFs (Table 7). These descriptions contribute to the expansion of the zone model as a theoretical perspective, which also applies to the forthcoming development descriptions.

Based on the results of Papers I and II, it is motivated to further develop the original zone model. The updated version, here referred to as the principal model of four zones of contact with the outdoors 2.0 (abbreviated: zone model 2.0) includes a schematic illustration of the cognitive status of older adults, represented by a brain showing different levels of tissue changes. Consequently, when designing outdoor environments, this aspect must also be considered. Furthermore, the updated version includes a schematic illustration of care workers as it is essential that the outdoor environments are also designed to support their work with older adults, to facilitate appropriate administrative tasks, and to provide access to secluded places for meals and recovery during shifts. Additionally, the care workers noted that the frailest older adults were often bedridden with no opportunity for environmental change. Therefore, it is motivated to expand the range of body positions/functional capacities to include a

schematic illustration of a person lying in a wheeled care bed. This addition clarifies that contact with outdoor environments and outdoor stays could be possible across multiple zones, regardless of body position—standing, sitting, or lying—whether in motion or still (Figure 31).

Table 7. Description of the zones related to the context of RCFs.

Zone 0	Zone 1	Zone 2	Zone 3	Zone 4
				
No contact with the outdoor environment from inside the building due to the absence of windows e.g. windowless rooms such as bathrooms, exercise room, medicine rooms, changing rooms, and storage areas.	Contact with the outdoor environment from inside the building through windows. Examples include places such as entrance rooms, corridors, apartments, living rooms, dining rooms, activity rooms, offices, rest rooms, conference rooms, and care workers' rooms/dining rooms	Contact with the outdoor environment in places between indoor and outdoor environments. Examples include entrances, balconies, patios, conservatories, greenhouses, orangeries, and roof terraces.	Contact with the outdoor environment through garden at ground floor, connected to the building and part of the property, accessible for use by all older adults and care workers. Examples include various vegetated places for meals, activities, exercises, and rest linked by paths. Excludes parking and transport area on the property.	Contact with the outdoor environment in public areas located within 300 meters from the building. Examples include parks, squares, cemeteries, recreational areas, sports areas, forests, agricultural landscapes, and features of water.

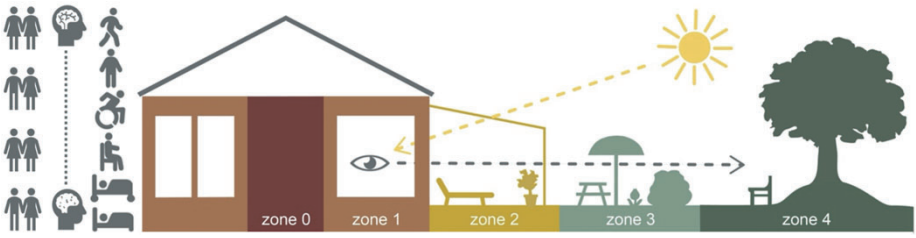


Figure 31. The principal model of four zones of contact with the outdoors 2.0. Illustration: M. Liljegren

Furthermore, it is motivated to introduce zones 1a, 1b, 2a, 2b, 3a, 3b, 3c, 4a, and 4b in the zone model 2.0. The introduction draws on information from the older adults (Study I) and care workers (Study II) concerning their experiences and needs of different types of outdoor environments. These additions are also based on physical environmental aspects within 300 meters of the RCFs in combination with the collected design solutions (Study IV).

Zone 1a refers to indoor rooms with windows positioned in a way that allows both daylight to enter the building and views of the outdoors. The views apply to all body positions (standing, sitting, and lying). Zone 1b, on the other hand, refers to indoor rooms where the windows are placed high, allowing only daylight to enter, but no outdoor views. Access according to zone 1a is preferable as it meets both the need for natural light and the opportunity for views. Additionally, zone 2a refers to weather-protected outdoor environments, such as glazed balconies, conservatories, and greenhouses, while zone 2b applies to exposed outdoor environments such as open balconies, patios, and roof terraces. Access to both zones 2a and 2b provides older adults and care workers with the flexibility to choose based on the weather conditions. Furthermore, zone 3a refers to fully enclosed courtyards, zone 3b to open courtyards/fenced gardens adjacent to each ward, and zone 3c to the outer fenced gardens surrounding the entire RCF. Zone 3a is completely enclosed by the building walls, with no contact with zone 4, whereas zone 3b is partially enclosed, allowing some contact with zone 4. Zones 3b and 3c are separated by gates and fences, creating varying levels of contact with Zone 4. Accesses to zones 3a, 3b, and 3c is likely to improve the sense of security of older adults and their care workers. Additionally, zone 4a refers to the surroundings within a 300-meter radius of the RCFs, while Zone 4b refers to the wider surrounding area. Proximity to nearby surroundings, such as parks and squares, is beneficial for both older adults and care workers. Figure 32 provides a plan view of all the zones, while Figure 33 showcases examples of RCF building designs and outdoor environments with a focus on Zones 3a, 3b, and 3c.

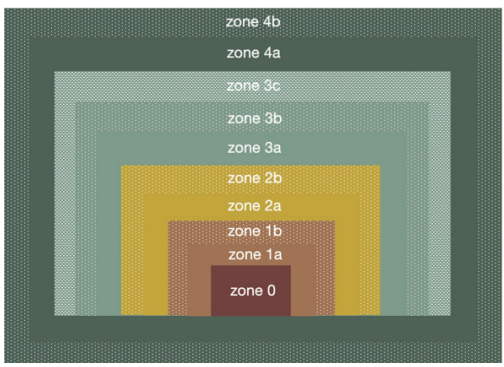


Figure 32. The zone model 2.0 structure including zones 1a-4b. Illustration: M. Liljegren

Figure 33. Zone 3a as an enclosed courtyard. Zones 3b and 3c are separated by white lines. ©Lantmäteriet

Based on the results from Papers I and II, the older adults have varying body positions/functional capacities that influence their ability to engage with the outdoor environments. The original zone model included descriptions of these different body positions and functional capacities (Bengtsson, 2015), but lacked details on how each position/capacity may manifest depending on whether the person is independent in their mobility or requires personal support from care workers. The developed descriptions, based on the results from Papers I and II and previous research on outdoor environments for older adults (Bengtsson & Lavesson, 2024; Bengtsson et al., 2018) (Table 8) provide insights into the physical conditions that can affect older adults' abilities to spend time outdoors. These insights are used to expand the zone model 2.0 as a theoretical perspective and can be applied in the design of outdoor environments to better meet the needs of older adults.

The results from Papers I and II showed that outdoor environments, particularly in zone 2 and the pathways in zone 3, were undersized for older adults using mobility aids and for care workers who support the older adults. According to the Swedish National Board of Housing, Building, and Planning, the turning dimensions for wheelchairs range from 1.3 to 2.0 meters (The Swedish National Board of Housing Building and Planning, 2022). Therefore, balconies, patios, conservatories, and garden pathways must be well-sized to allow older adults to move without bumping into walls or accidentally ending up outside the walking paths. Furthermore, it is important to note that this measurement applies to a single mobility aid user while activities at RCFs, such as meals, social activities, and exercise, are often conducted with several older adults with mobility aids at the same time. Therefore, the environments must accommodate not only individual mobility aid users but also groups of older adults with these mobility aids, meaning there must be enough space for the older adults, their mobility aids, and the care workers. The mentioned measurements are not connected to the results in Study IV as the focus was solely on mapping access to specific physical environmental aspects rather than on addressing the measurements of these aspects.

Given that cognitive status is included in the zone model 2.0, it is motivated to describe the spectrum from high to low cognitive ability to enhance information of the environmental interactions within the RCFs' contexts. The descriptions, based on the results from Papers I and II and previous research focusing dementia and outdoor environments for older adults with dementia (Cooper Marcus & Barnes, 1999; Kolanowski et al., 2017; Nordin, Liljegren, et al., 2024; Zabar, 2020) provide insights into the cognitive conditions that can affect older adults' abilities to spend time outdoors (Table 9). These insights further expand the zone model 2.0 and can be applied in the design of outdoor environments. When considering cognitive status, it is important to be aware that dementia in older adults typically leads to deterioration over time. Therefore, it is beneficial if the outdoor environments at RCFs have a high degree of supporting aspects and accommodate the diverse combinations of body positions/functional capacities and cognitive statuses. For example, some older adults may possess high body position/functional capacity but have lower cognitive abilities, or vice versa.

Table 8. Description of body positions/functional capacities. Illustration: M. Liljegren

Body position/ functional capacity	Description
In motion – standing 	Position: Vertical standing body position when walking, with or without mobility aid in terms of walker, crutch, or cane. *Independent person:* Typically has full access to outdoor environments with the ability to move freely within and between zones 1-4. *Person dependent of personal support:* Experiences limited contact with the outdoor environments as support is needed for movement but may not always be available when desired. When support is provided, access to zones 1-4 becomes possible.
Standing 	Vertical standing body position when still with or without mobility aids such as walker, crutch, or cane. Typically allows full access to contact with outdoor environments by standing within respective zone.
In motion – sitting 	Vertical sitting body position when moving in wheelchair. *Independent person:* Typically has full access to outdoor environments with the ability to move freely within and between zones 1-4. *Person dependent of personal support:* Experiences limited contact with the outdoor environments as support is needed for movements but may not always be available when desired. When support is provided, access to outdoor environments in zones 1-4 becomes possible.
Sitting 	Vertical sitting body position when still. Typically allows full access to outdoor environments by sitting within respective zone.
In motion – lying 	Horizontal lying body position when being moved in a wheeled care bed. *Dependent on personal support:* Has limited access to outdoor environments as support is needed but may not always be available when desired. When support is provided, access to the outdoor environments in zone 1-3 becomes possible.
Lying 	Horizontal lying body position in care bed without wheels. Typically, contact with the outdoor environments is possible in two ways: by lying on one's back in zone 1 with the bed positioned facing a window, or by lying on one's side in zone 1 with the bed positioned next to a window.

Furthermore, given that care workers are included in the zone model 2.0, it is motivated to describe them to increase information of the environmental interactions at RCFs. A conducive Swedish work environment for care workers includes three key components: (1) the physical environment, (2) the digital environment, and (3) organizational and social work environment (Suntarbetsliv, 2021). For person-centred care and rehabilitation outdoors, the physical as well as the organizational and social work environments are particularly relevant. The description, based on the results from Papers II, previous research focusing person-centred care (Backman et al., 2021), and information about work environments (Suntarbetsliv, 2021; The Swedish Work Environment Authority, 2017) (Table 10) provide insights into work environment

conditions that can affect care workers' abilities to fulfil person-centred care. These insights expand zone model 2.0 and can be applied in the design of the outdoor environments.

Table 9. Description of cognitive status. Illustration: M. Liljegren

Cognitive status	Description
High cognitive status 	High ability to remember, orient oneself in time and space, initiate everyday activities, understand instructions, solve problems as well as use language and numbers. Social interaction with others works well. The ability to express needs of and take initiatives for contact with nature and outdoor stays is high in combination with clear understanding of how to move between indoor and outdoor environments, as well as within outdoor environments.
In between cognitive status	Moderate ability to remember, orient oneself in time and space, initiate everyday activities, understand instructions, solve problems as well as use language and numbers. Social interaction with others generally works, though challenges may arise at times. The ability to express needs of and take initiatives for contact with nature and outdoor stays varies, often linked to difficulties in understanding how to move between indoor and outdoor environments, as well as within outdoor environments.
Low cognitive status 	Limited ability to remember, orient oneself in time and space, initiate everyday activities, understand instructions, solve problems as well as use language and numbers. Social interactions with others sometime work but are often challenging. The ability to express needs of and take initiatives for contact with nature and outdoor stays is low in combination with a diminished understanding of how to move between indoor and outdoor environments as well as within outdoor environments.

Table 10. Description of care workers. Illustration: M. Liljegren

Care workers	Description
Care workers' perspective 	Having a good physical work environment at RCFs can, for example, include well-adapted places and access to mobility aids to support older adults. The Swedish Work Environment Authority has clarified the importance of enough space for care and rehabilitation tasks, benefiting both care workers and the older adults. Sufficient space is needed to prevent need for harmful movements, such as stretching and twisting. Typically, about 0.8 meters of working space per care worker is needed (The Swedish Work Environment Authority, 2017), which applies in all four zones where support is provided to older adults. A supportive organizational and social work environment includes the way tasks are structured and communicated as well as the decision-making processes and the interactions among care workers and managers at RCFs. For the care workers to have good prerequisites to offer person-centred care and rehabilitation outdoors, the leadership needs to show the way and enable a good work culture between care workers who work both indoors and outdoors.

It is important to highlight the connection between body positions/functional capacities, cognitive status, and care workers in zone model 2.0 and the 19 health-promoting design qualities as existing research on these qualities primarily focuses on older adults in general and general healthcare settings (Bengtsson, 2015). In the context of this thesis, each design quality needs to be considered in relation to each body position/functional capacity and cognitive status of older adults as well as to care workers, ensuring that outdoor environments support both everyday use and person-centred care and rehabilitation (Figure 34).

The final connection between the results from Papers I and II and zone model 2.0 relates to the transitions between the zones. The need for these descriptions arises from the challenges older adults face using wheeled mobility aids when changing zones. To clarify these challenges, zone model 2.0 has been developed to include illustrations of barriers. All transitions within RCFs should facilitate easy movement in both directions, accommodating the body positions/functional capacities of older adults as well as the needs of care workers. Figure 35 illustrates the transitions and Table 11 provides a description of each one. The insights from this perspective expands zone model 2.0 and can be applied in the design of the outdoor environments to better meet these needs.

To further increase information concerning the zones, the RCF outdoor model is introduced. The model highlights access to zones, body positions/functional capacities, cognitive status, care workers, and a gradient of privacy versus public exposure (Figure 36). The top of the model represents indoor environments (zones 0-1), while the middle to the base represents outdoor environments (zones 2-4). The gradient, line with arrows, illustrates different levels of access to indoor and outdoor environments, representing a spectrum from private to public environments. In the most private environments, the older adults are in their own apartments. As they move outward, their environments become progressively more public. In the figure, the order of body positions/functional capacities and the heads representing cognitive status are reversed compared to their representation in the original zone model and in zone model 2.0. This reversal reflects that older adults with declining physical and cognitive health tend to be confined to the zones at the top of the model. The results of Paper I indicate that older adults requiring personal support for outdoor stays experience prolonged indoor stay as confining and involuntary whereas those who can move independently experience a sense of freedom in their choices of zones they wish to be in.

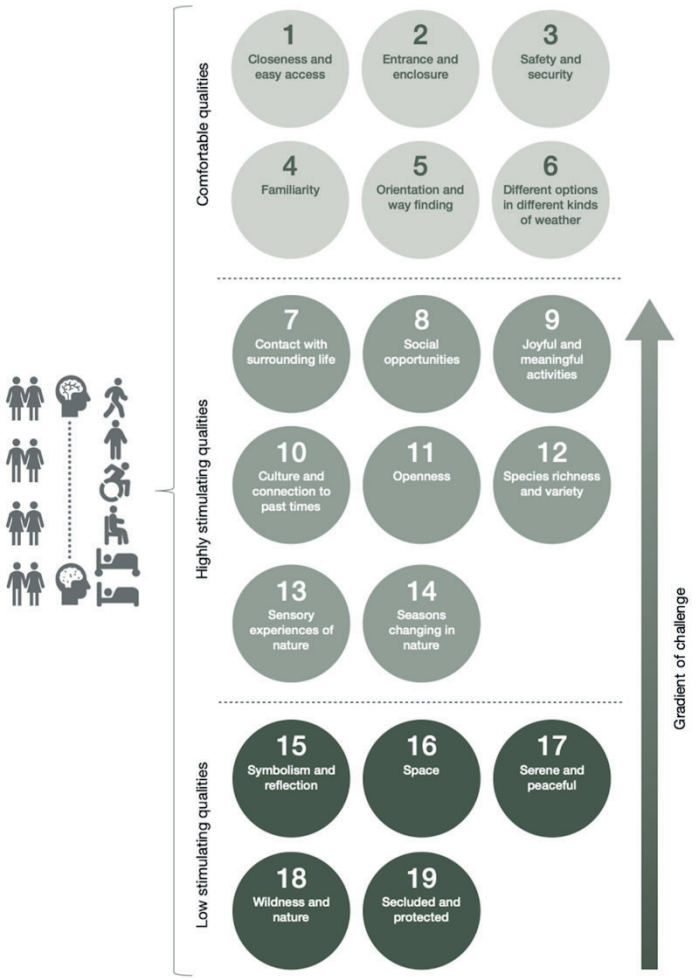


Figure 34. The relationship between body positions/functional capacities, cognitive status, care workers and the 19 design qualities. Illustration: M. Liljegren

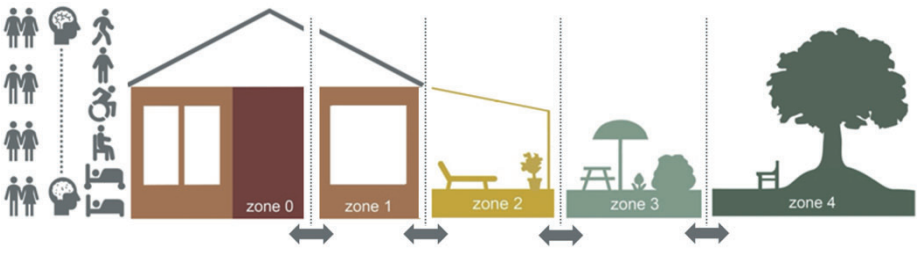


Figure 35. Transitions between the zones in zone model 2.0. Illustration: M. Liljegren

Table 11. Description of the transitions between the zones in zone model 2.0. Illustration: M. Liljegren

Transition zone 0-1	Transition zone 1-2	Transition zone 1-3	Transition zone 2-3	Transition zone 3-4
				
The transition from a windowless room to a room with a window typically includes an inner door and a threshold that creates a level difference between the two zones. The ground surfaces are often the same and consist of inner floor.	The transition from an entrance room or an indoor room with a window to an outdoor environment, such as a balcony, patio, or conservatory, typically involves a door that features a threshold creating a level difference. The flooring often varies, with an inner floor transitioning to concrete, wooden decking, or stone slabs outside. An automatic door opening feature may be available. Additionally, the transition can consist of an operable window.	The transition from an indoor room with a window to the garden typically includes a front door that features a threshold, creating a level difference between the two zones. The flooring often differs, with the inner floor meeting stone slabs or asphalt outside. An automatic door opening function may be available to facilitate access. The transition can also consist of an operable window.	The transition from a patio or conservatory to a garden often includes varying ground surfaces. For example, a concrete floor, wooden deck, or stone slabs may meet asphalt, hard-packed stone, gravel, or grass. This transition can also include level differences between the zones, often manifested as a single step.	The transition from the garden to the surroundings typically includes a fence with a gate, and the ground surfaces are usually consistent, such as asphalt, stone slabs, or hard-packed stone. Level differences between these zones are uncommon.

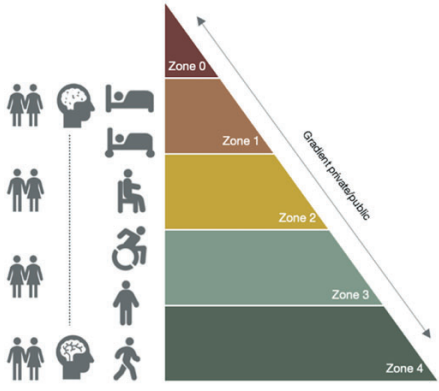


Figure 36. The RCF outdoor model. Illustration: M. Liljegren

The results of Paper IV showed that several Swedish RCFs have limited access to outdoor environments, warranting a need to discuss potential consequences for the older adults and care workers. The discussion is based on the RCF outdoor model serving as a way to further expand this theoretical perspective. Absence of windows (zone 1) limits contact with nature and natural daylight, which negatively impacts health (The Swedish Work Environment Authority, 2019). Lack of a zone 2 restricts access to outdoor environments, making older adults more reliant on indoor environments. For RCFs with multiple floors and, for example, no access to balconies, the lack renders outdoor stays difficult and even impossible as it can be too demanding for older adults to reach the gardens. Lack of zone 2 also means that older adults who require personal support become more dependent on care workers. Paper IV revealed that 41.5% of Swedish RCFs share gardens with other organizations. In these cases, zone 3 functions more like a zone 4, and the unique design qualities that zone 3 typically offers—particularly the comfort design qualities—are lost. Furthermore, 4.1% of RCFs lack garden access, further confining older adults to indoor environments and to the outdoor environments in zone 2. Some RCFs are over 300 meters away from public open spaces, public areas with high vegetation, public areas for physical activity, water contact, and squares, which deprives older adults of health-promoting environments and community interaction. These consequences also limit the care workers' possibilities to offer person-centred care and rehabilitation outdoors.

When older adults cannot move independently between zones and lack personal support for outdoor stays, their environment becomes confined to the indoors. Those who were dependent on personal support expressed frustration, feeling deprived of the basic human need for outdoor access, which negatively impacted their health. Even if zones 2-4 are physically accessible, they may still be inaccessible to those who would benefit most from outdoor stays (Ottosson & Grahn, 1998, 2005, 2013). Therefore, care workers must provide person-centred care and rehabilitation outdoors to enrich older adults' everyday environments and ensure their outdoor needs are met. By not using zones 2-4, the outdoor environment's full health-promoting potential remains untapped, turning it into an underutilized resource.

SYNTHESIS OF ZONE MODEL 2.0 AND ECOLOGICAL MODEL

To gain further information of the interaction between older adults and the physical environments at RCFs, a synthesis of zone model 2.0 and the ecological model has been carried out (referred to as 'towards the ecological model of aging 2.0' and abbreviated 'ecological model 2.0') (Figure 37). As older adults' competences—defined in zone model 2.0 as body positions/functional capacities and cognitive status—decline (Y-axis in Figure 37), their abilities to independently access zones farther from the RCFs decrease as environmental pressures increase (X-axis). To counteract this scenario, a personal support gradient shows that as decline intensifies, more care worker support is needed to meet basic needs of contact with nature and outdoor stays. This model synthesis provides valuable theoretical development for better understanding the person-environment interaction in the context of RCFs.

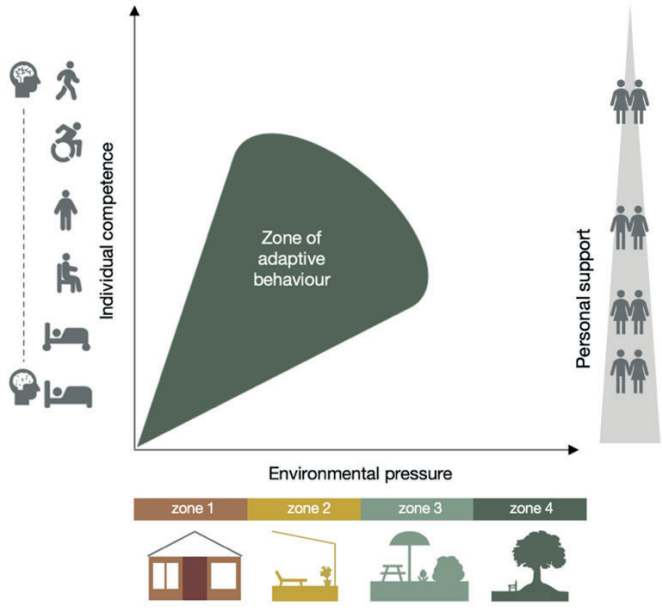


Figure 37. The ecological model of aging 2.0. Illustration: M. Liljegren

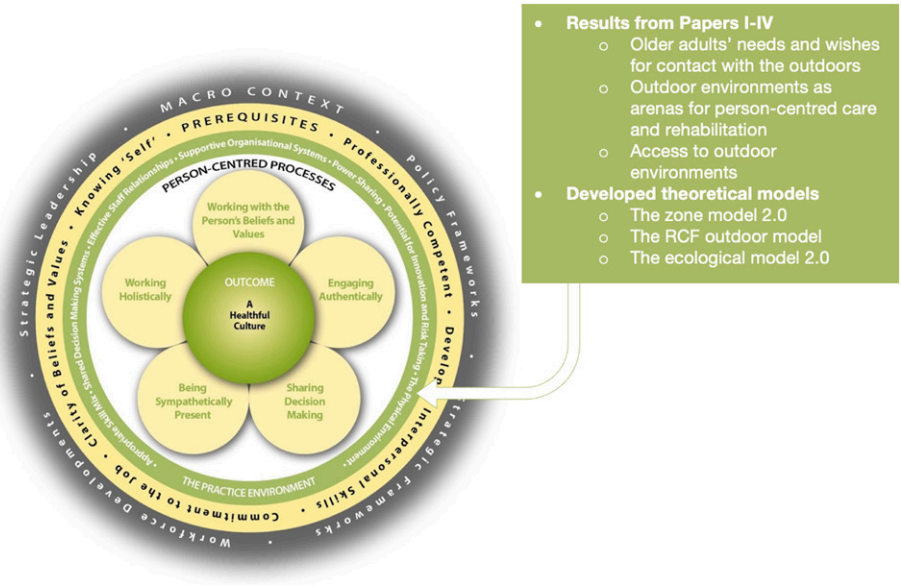


Figure 38. The knowledge of physical environments within the person-centred practice framework, as outlined by T. McCance and B. McCormack (2021), is expanded by including the results of Papers I-IV and the theoretical models developed. Illustration: M. Liljegren

SYNTHESIS OF RESULTS, MODELS, AND PERSON-CENTRED PRACTICAL FRAMEWORK

By synthesizing the results from Papers I-IV, the theoretical models, and the person-centred practice framework, this thesis expands knowledge of physical environments for older adults and care workers at RCFs. Figure 38 illustrates how the results and the models are included into the framework, particularly in the section 'the practical environment' under sub-heading 'the physical environment'. The figure summarizes the theoretical implications, which include needs and wishes, body positions/ functional capacities, cognitive status, and environmental aspects influencing movement. It also covers access to zones 1-4, the 19 design qualities, and how older adults and care workers can engage in the four zones as part of everyday life and for person-centred care and rehabilitation outdoors.

PRACTICAL IMPLICATIONS

The results can potentially improve public health among Sweden's oldest population and their care workers. To meet the older adults' need for nature and outdoor stays and to improve the care workers' work conditions, recommendations are provided at three levels: individual, municipal, and national. Each level is described below and in Figure 39.

INDIVIDUAL AND RELATIVE LEVEL

At individual level, older adults who have sufficient physical and cognitive abilities can initiate contact with nature and outdoor stays to meet their personal needs. This reflects a sense of personal responsibility in making the outdoor environments part of everyday life. For those with physical and/or cognitive decline, personal support is needed to facilitate such engagement, support that can be provided by relatives.

- Recommendation to older adults: Initiate contact with nature and outdoor stays as often as possible. To benefit from the positive health effects of outdoor stays, it is recommended to spend at least two hours outdoors per week, all year round (White et al., 2019). For older adults with dementia, 30 minutes of daily outdoor stay is beneficial, regardless of the season (van der Velde-van Buuringen et al., 2021).
- Recommendation to relatives: To support older adults at RCFs, relatives can regularly arrange possibilities of contact with nature from inside the building via windows or outdoor stays on balconies and patios as well as in gardens or nearby parks. For example, older adults may enjoy walks, outdoor meals (Swedish fika), and conversations.

Figure 39. Practical implications at individual and relative level, municipal level, and national level. Illustration: M. Liljegren

MUNICIPAL LEVEL

At municipal level, practical implications focus on ensuring access to high-qualitative designed zones at RCFs and use of the outdoor environments for person-centred care and rehabilitation. These recommendations are directed to planners, architects, and landscape architects, managers at municipal level, managers at RCF level, and care workers.

The 19 health-promoting design qualities and the supportive environmental aspects in Papers I and II can guide the design of these zones. Furthermore, three municipal examples provide inspiration: (1) Gothenburg has developed a guideline to ensure access to zone 3, calculating outdoor environments in square meters per number of apartments (The City of Gothenburg, 2023); (2) Malmö has implemented an outdoor

stay guarantee, ensuring daily offers of visits in zones 2-3 and weekly visits to zone 4 (The City of Malmö, 2023); and (3) Lund offers individually tailored outdoor walks for older adults with BPSD challenges (The Swedish BPSD register, 2022).

- Planners, architects, and landscape architects: Ensure access to high-quality designed outdoor environments at RCFs as an integral part of local urban planning by using the 19 health-promoting design qualities and the listed supportive environmental aspects (Papers I and II).
- Managers at municipal level: Develop a routine that supports care workers use of the outdoor environments as arenas for person-centred care and rehabilitation as well as for relevant administrative work.
- Managers at RCF level: Include person-centred care and rehabilitation outdoor as a topic in workplace meetings.
- Managers at RCF level: Include the outdoor environments as part of the work environment.
- Managers at RCF level and care workers: Ensure that older adults with lower body positions/functional ability and cognitive status receive personal support in satisfying their basic human needs for contact with nature and outdoor stays, preferably daily.
- Managers at RCF level and care workers: Develop scheduling by specifying which of the shifts social care workers and healthcare workers will work indoors versus outdoors.
- Managers at RCF level and care workers: Develop care and rehabilitation plans for older adults by specifying whether the planned interventions should take place indoors and/or outdoors.

NATIONAL LEVEL

At the national level, the practical implications focus on a national strategy, digital infrastructure, and education. The recommendations are directed to decision-makers and authorities.

The first implication highlights the need to adopt the proposed *National strategy for access to the outdoor environment and outdoor stays for older adults at RCFs* which is developed in a separate study within the overall OUT-FIT project (Bengtsson et al., Submitted to journal). This strategy is essential to ensuring access to outdoor environments, outdoor stays, and person-centred care and rehabilitation outdoors.

The second implication emphasizes the need to develop digital infrastructure at RCFs related to health data outcomes (Forska!Sverige, 2024). Specifically, this demands synchronizing the results of access to zones 1-4 (Paper IV) with health data from existing national digital quality registries for older adults at RCFs. Such an improved infrastructure would allow for the investigation of correlations between access to zones 1-4 and aspects such as medication use (via the National prescribed drug register) and BPSD symptoms (via the BPSD register). Such research would, in turn, further improve understanding of person-environment interaction. In parallel, it would also be

beneficial to develop a new national quality register to monitor care workers' health in relation to their access to zones 1-4. This would provide valuable insights into how work environments impact health. One advantage of having this type of information is an increased awareness of access to outdoor environments as a health resource, allowing for the long-term monitoring of these areas as living environments for older adults and work environments for care workers. Another benefit is that the information can guide the design and placement of RCFs in terms of access to outdoor environments.

The third implication focuses the need for education in person-centred care and rehabilitation outdoor for current care workers, RCF managers, and students in relevant fields (e.g., assistant nurses, activity leaders, nurses, occupational therapists, physiotherapists). To optimize the outdoor environments, education also needs to target students and practicing architects and landscape architects since they design the zones. The third implication also includes the need to develop a national, mobile (Mont, 2018), and interdisciplinary research platform, focusing age-friendly living environments. Such a platform would increase understanding of how older adults interact with their indoor and outdoor environments and the impacts of these on their health and well-being. It could also serve as a hub for developing educational modules and research methods related to these interactions as well as support decision making with both evidence and evidence-based methods regarding living environments for older adults.

- Adopt the proposed strategy, *National strategy for access to the outdoor environment and outdoor stays for older adults at RCFs*.
- Develop digital infrastructure in elderly care by synchronizing data on accesses to zones 1-4 with health data from existing national digital quality registries at RCFs and establish a new registry focused on care workers' health in relation to their accesses to zones 1-4.
- Ensure education in person-centred care and rehabilitation outdoors and well-designed outdoor environments. The recommendation also includes developing a national, mobile, and interdisciplinary research platform for age-friendly living environments.

The recommendations are numerous, highlighting the complexity of developing and using outdoor environments at RCFs. If there is uncertainty about where to start, it is recommended that, pending national guidance, each manager at the municipal level create a prioritization list and implement one or a few recommendations at a time. Just as the studies in this thesis were carried out through collaboration across disciplines, the implementation of these recommendations will require collaboration between various organizations and professionals within each municipality.

SYNTHESIS OF IMPLICATIONS

Finally, the thesis ties the implications together in a guideline, the 1-2-3-4 zone rule (abbreviated the zone rule), which emphasize access to zones 1-4 for older adults and care workers at RCFs. Specifically, access to zone 1 refers to windows allowing natural light into the buildings and providing nature views; zone 2 to entrances, balconies, patios, and conservatories; zone 3 to own gardens; and zone 4 to the surroundings. The theoretical perspective offers practical guiding for access to health-promoting outdoor environments. Applying the zone rule in planning of RCFs ensures that all zones are accessible and can be used as part of everyday life and as arenas for person-centred care and rehabilitation.

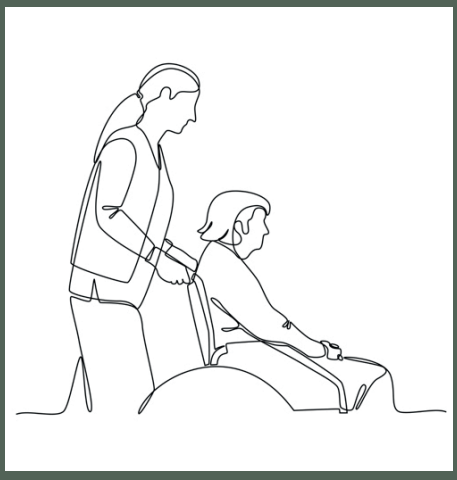
Since both the zone rule and the 3-30-300 rule aim to develop health-promoting outdoor environments, a synthesis of these rules is offered for a comprehensive approach to ensuring access to health-promoting and green environments for older adults and care workers at RCFs. This synthesis, referred to as 'the RCF outdoor planning rule', ensures access to outdoor environments by including key principles from both rules. It requires that RCFs provide access to windows (zone 1) that allow natural light into the buildings and offer views of at least three trees from both the older adults' apartments and care workers' workplaces. Additionally, it emphasizes access to entrances, balconies, patios, conservatories (zone 2), own gardens (zone 3), and surroundings (zone 4) with at least 30% tree canopy cover. Lastly, it ensures that parks or other green spaces (zone 4) are located within 300 meters of RCFs (Figure 40). However, since 300 meters may be too far for some older adults, it is especially important to prioritize high-quality design in zones 1-3.

Figure 40. The RCF outdoor planning rule, which is a fusion of the 1-2-3-4 zone rule and the 3-30-300 rule. Illustration: M. Liljegren

By considering these implications, it is possible to achieve the future scenario illustrated on the cover of this thesis: that RCFs become an integrated part of the urban environment; that all RCFs have high access to zones 1-4; that all older adults at RCFs are given the opportunity to use outdoor environments as part of their daily lives to the extent they need and wish; and that outdoor environments are naturally used as arenas for person-centred care and rehabilitation. Additionally, it must be ensured that designated and adapted outdoor environments are available for care workers to use for relevant administrative tasks and during breaks.

The theoretical and practical implications of this thesis serve as springboards for future research, as outlined in the following section.

FUTURE RESEARCH



FUTURE RESEARCH

Unsurprisingly, the results and outcomes of this thesis have raised further questions as well as ideas for future studies, focusing on gaining increased insights into the conditions for person-environment interaction and methods development. The results and outcomes have also highlighted the need for a digital infrastructure of elderly care and to develop university municipalities.

One question is how older adults with dementia and those who do not speak Swedish experience contact with nature and outdoor stays in zones 1-4 at Swedish RCFs. Furthermore, the results of the national mapping of accesses to zones 1-4 showed variations, highlighting the need for future research to investigate how older adults at RCFs with limited access versus high access perceive their quality of life and how this impacts their health. Studies could also focus on measurements of balconies and patios, as both older adults and care workers noted that these environments were too small. Another question is how older adults' needs for contact with nature and outdoor stays are met when only roof terraces and enclosed courtyards are available. Additionally, future research could investigate the impact of not having access to an own garden. Furthermore, the location of RCFs within cities and communities needs to be investigated to increase information on how older adults and care workers use them.

From the care workers' perspectives, additional research is needed to investigate their working conditions when working in outdoor environments with older adults and when using the outdoors for administrative tasks. Furthermore, studies can investigate how person-centred care and rehabilitation outdoors can be effectively implemented across all Swedish RCFs.

Two of the studies (Papers I and II) used walking interviews as method. Although this method is well-described in general in the literature (King & Woodroffe, 2019), further method development studies are needed to explore and refine its application specifically within healthcare settings and RCFs. To gain increased understanding of the person-environment interaction, qualitative walking interviews could be complemented with quantitative physiological measurements (such as heart rate and skin conductance) and environmental data collected through GPS, accelerometers, temperature sensors, and sound level measurements (The Swedish University of Agricultural Sciences, 2023).

To improve the quality of the matrix for mapping access to outdoor environments, future studies need to test its reliability and validity. A development of the matrix could also include converting the qualitative design aspects of QET into measurable quantitative variables alongside selected variables from the evidence-based tools

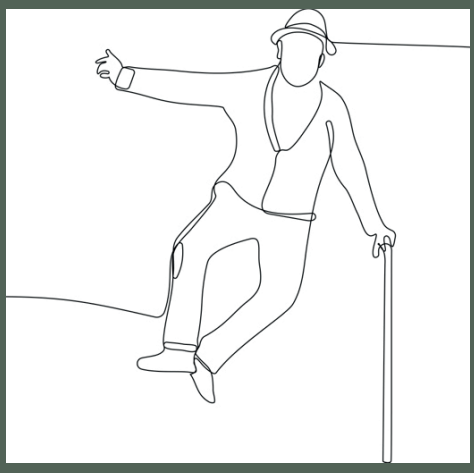
Housing enabler (Iwarsson et al., 2012), S-SCEAM (Nordin et al., 2015), and SOS Tool (Bardenhagen et al., 2018; Rodiek et al., 2016). These studies would result in an evidence-based instrument that focuses on designing health-promoting indoor and outdoor environments tailored specifically to RCFs. Moreover, expanding the use of the developed matrix to other settings, such as RCFs for young people, geriatric hospital wards, and homecare services, can offer valuable insights and broaden its applicability. Future studies using the RCF outdoor planning rule for designing health-promoting outdoor environments at RCFs are also of importance, specifically to explore whether the 300-meter distance is relevant or if it is too far for older adults at RCFs related to their health conditions,

On an overall level, a guideline is also needed to address supportive and hindering aspects within each zone, along with a practical working method for designing and planning health-promoting environments at RCFs.

Future studies could try to develop digital infrastructure that links access to outdoor environments at RCFs with health outcomes from existing national quality registers for older adults. To increase knowledge about the care workers' health related to their work environments, a separate register needs to be developed and tested.

Finally, in Sweden, collaboration between regional university hospitals and the academia is well established. With the ongoing shift towards local care—where health care actions are primarily provided in people's homes, including RCFs—there is a need to increase research grounded in the municipal context. This could be achieved through the establishment of so called university municipalities. Similar initiatives have already been launched in Norway, with the goals of: (1) ensuring municipalities to have access to relevant, up-to-date knowledge and competencies, (2) creating platforms for research-based education, continuing education, training, student placements, doctoral programs, and research and innovation in strategically important areas for the sector, and (3) establishing a new model for ongoing mutual competence and knowledge transfer between municipalities and academia (Trondheim municipality, 2022). Municipalities within university cities should take the lead, however, it must be in the interest of all municipalities to support research in municipal elderly care. Therefore, each municipality could benefit from appointing researchers as liaisons between RCFs/home healthcare services and academia, to foster a research-driven culture.

ACKNOWLEDGEMENT



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APPENDICES

APPENDICES

APPENDIX A: INTERVIEW GUIDE FOR STUDY I

The interview guide is in Swedish.

Initiala frågor

- Vad betyder det för dig att vara utomhus?
- Hur ofta är du utomhus under sommaren/hösten/vintern/våren? Gäller det varje dag?
- Har du möjlighet att vistas utomhus i den omfattning du önskar? Om nej, vad är anledningen till det?
- Behöver du hjälp med att komma utomhus? Om ja, vilken?
- Vad gör du när du är utomhus?
- Vilka aktiviteter deltar du vanligtvis i här på boendet (både inomhus och utomhus)?
- Har du någon funktionsnedsättning som innebär att du deltar i någon träningsinsats/rehabilitering? Om ja, vad är det för funktionsnedsättning, vad tränar du, vilken personal tränar du med och var sker träningen?

Zon 1

- Kan du visa exempel på platser inomhus där du uppskattar att vistas?
- Vad brukar du göra på dessa platser?
- Har utemiljön/omgivningen betydelse för det du önskar göra på dessa platser? Om ja, på vilket sätt?
- Är det någon skillnad mellan att göra det du önskar göra på just denna plats jämfört med utomhus? Om ja, vad är skillnaden?
- Hur upplever du att det fungerar att förflytta dig inomhus på boendet? (Ex. underlättande faktorer, hinder, stimulans.)
- Vad är din uppfattning kring att genomföra rehabiliteringsinsatser inomhus?
- Finns det platser inomhus där du träffar dina anhöriga? Om ja, vilka? Vad är din reflektion kring dem?

Övergången zon 1 – zon 2

- Hur upplever du att det fungerar att förflytta dig mellan inomhus och balkongen/uteplatsen/uterummet på boendet? (Ex. underlättande faktorer, hinder, stimulans.)

Zon 2

- Kan du visa exempel på platser som är mellan inomhus och utomhus där du uppskattar att vistas? (Ex. balkong/uteplats/uterum osv.)
- Vad brukar du göra på dessa platser?
- Är det någon skillnad mellan att göra det du önskar göra på just denna plats jämfört med inomhus? Om ja, vad är skillnaden?
- Hur upplever du att det fungerar att förflytta dig på balkongen/uteplatsen/uterummet? (Ex. underlättande faktorer, hinder, stimulans.)
- Vad är din uppfattning om att genomföra rehabiliteringsinsatser på balkongen/uteplatsen/uterummet?
- Finns det platser mellan inomhus och utomhus där du träffar dina anhöriga? Om ja, vilka? Vad är din reflektion kring dem?

Övergången zon 2 – zon 3

- Hur upplever du att det fungerar att förflytta dig mellan inne- och utemiljö vid huvudentrén vid boendet? (Ex. underlättande faktorer, hinder, stimulans.)
- Hur upplever du att det fungerar att förflytta dig mellan uteplatsen/uterummet och vidare ut till trädgården? (Ex. underlättande faktorer, hinder, stimulans.)

Zon 3

- Kan du visa exempel på platser i trädgården där du uppskattar att vistas?
- Vad brukar du göra på dessa platser?
- Är det någon skillnad mellan att göra det du önskar göra på just denna plats jämfört med inomhus? Om ja, vad är skillnaden?
- Hur upplever du att det fungerar att förflytta dig i trädgården? (Ex. underlättande faktorer, hinder, stimulans.)
- Vad är din uppfattning om att genomföra rehabiliteringsinsatser i trädgården?
- Finns det platser i trädgården där du träffar dina anhöriga? Om ja, vilka? Vad är din reflektion kring dem?

Övergången zon 3 – zon 4

- Hur upplever du att det fungerar att förflytta dig mellan trädgården och boendets omgivning? (Ex. underlättande faktorer, hinder, stimulans.)

Zon 4

- Vad kännetecknar just det här området för dig?
- Vad tycker du om att boendet ligger just här, i det här området?
- Finns det något som du tycker är särskilt betydelsefullt här i omgivningen? (Ex. platser, inslag eller funktioner.)
- Finns det någon plats, inslag eller funktion som du saknar i omgivningen?
- Vilka fördelar tycker du att det finns med att boendet ligger just här?

- Vilka nackdelar tycker du att det finns med att boendet ligger just här?
- Vilka platser i omgivningen uppskattar du att vistas i?
- Vad brukar du göra på dessa platser?
- Är det någon skillnad mellan att göra det du önskar göra på just denna plats jämfört med inomhus? Om ja, vad är skillnaden?
- Hur upplever du att det fungerar att förflytta dig i boendets omgivning? (Ex. underlättande faktorer, hinder, stimulans.)
- Vad är din uppfattning om att genomföra rehabiliteringsinsatser i boendets omgivning?
- Finns det platser i omgivningen där du träffar dina anhöriga? Om ja, vilka? Vad är din reflektion kring dem?

APPENDIX B: INTERVIEW GUIDE FOR STUDY II

The interview guide is in Swedish.

Initiala frågor

- Vad betyder det för er (USK, AS, AT, FT och SSK) att vara utomhus?
- Skulle ni (USK, AS, AT, FT och SSK) kunna överföra den betydelsen i ert dagliga arbete med hyresgästerna?

Zon 1-4

- Kan ni visa exempel på zon 1/2/3/4, där ni genomför arbetsuppgifter som inkluderar hyresgästerna?
- Hur skulle var och en av er kunna använda den här platsen (zon 1, zon 2, zon 3 och zon 4) för att genomföra era huvudsakliga/ordinarie arbetsinsatser som inkluderar äldre personer?
- Vad skulle fungera bra? Vad skulle inte fungera? Underlättande faktorer? Hinder?
- Vilken betydelse har kontakten med utemiljön/omgivningen för arbetsinsatserna på denna plats?
- Hur fungerar det/skulle det fungera för er att genomföra insatser i denna zon/i jämförelse med zon 1/i jämförelse med övriga zoner (fördelar/nackdelar med zonen)?

Zon 1-4 och övergångar

- Hur upplever ni som personal att det fungerar för hyresgästerna att förflytta sig i och mellan zonerna (med/utan förflyttningshjälpmedel)? I zon 1? Mellan zon 1 - zon 2/i zon 2? Mellan zon 2 - zon 3/i zon 3? Mellan zon 3 - zon 4/i zon 4?
- Vad tror ni som personal skulle stimulera/underlätta/försvåra att förflytta sig i och mellan zonerna?

- Vad tror ni som personal skulle öka självständigheten i förflyttningar i och mellan zonerna?
- Vad tror ni som personal skulle öka möjligheten för förflyttningar i och mellan zonerna för de personer som behöver stöd från personal/anhörig?

Särskilda frågor avseende zon 4

- Vad skulle ni säga kännetecknar just det här området?
- Tycker ni att det finns något särskilt positivt med att boendet ligger just här, i det här området?
- Finns det några platser eller inslag som ni tänker är särskilt betydelsefulla här i omgivningen?
- Finns det något annat som är särskilt betydelsefullt här i omgivningen?
- Finns det någon/några särskilt viktiga platser eller inslag riktigt nära? / Längre bort?
- Finns det någon plats ni saknar i omgivningen?
- Vilka för- och nackdelar tycker ni att det finns med att boendet ligger just här?

APPENDIX C: MANUAL FROM STUDY III

For research assistants: Introduction to mapping outdoor environments at RCFs

This manual describes four phases: 1) Before the review; 2) Conducting the review; 3) After the review and 4) Random checks. The overall principle is that all data included must be clear. In the case of doubt, the data should be excluded. Before starting the review, one must ensure that one has the following documents: the manual, the matrix, drawings (on an USB flash drive), the document '*Kommungruppsindelning* 2023' (the Swedish municipal group classification from 2023) and a template to document interesting design examples. Should any questions occur, please feel free to contact the research group.

Phase 1: Before the review (Steps 1-10)

1. Open Outlook and go to the aldreboende@slu.se mailbox. The mailbox contains folders for all municipalities (290), sorted in alphabetical order. The RCF drawings are presented at the municipal level. If drawings for an RCF are sent in a single email, it is placed in a subfolder with the name of the RCF. When the drawings of several RCFs were sent in a joint email, they were placed in a subfolder called '*Boenden*' (RCFs). When the drawings for one or several RCFs were sent using a cloud service, they were downloaded to the USB flash drive that you received. In the mailbox, this is noted by adding 'USB' to the subfolder named 'Boenden', that is 'Boenden – USB'. In each municipal folder, there is also a subfolder named '*Övrigt*' (Other). Here, all email conversations with the municipality are saved. If you believe information is missing, check the subfolder

'Övrigt'. In some cases, the municipalities named the RCF according to its property designation. We only have access to the names and addresses for each RCF. In these cases, a translation table has been provided so we know which RCF belongs to which property designation. These emails are marked with a red flag, so they can be easily found in each municipality's folder.

2. Identify the municipality with which you will work.
3. Once you have identified which municipality you will work with, write your initials beside the municipality's name in capital letters, so other people in the project will know that you are reviewing this municipality. Hence, the duplication of work will be minimized.
4. Start by creating an overview of the RCFs in the municipality. How many RCFs are there? How many drawings/other documents did we receive per RCF? Note! Some municipalities have sent many drawings per RCF with several hundred documents. Skip reviewing these initially, they will be reviewed at a later stage. Write a comment about this in the matrix for the first RCF in the municipality (Column F), so the information is easy to find.
5. Identify the drawings of the RCF to examine.
6. Work with one RCF at a time. Check the drawings. If you find words such as '*äldreboende*', '*särskilt boende*', '*ålderdomshem*' or '*vård- och omsorgsboende*' (different Swedish terms for RCFs), the drawings should be included. If you find words such as '*gruppboende*' (group accommodation) or '*vårdcentral*' (healthcare centre), make a note in the matrix. We will discuss whether they are relevant. If you realise upon review that you have not received complete documentation from the municipality, you should not contact them to supplement the material. Instead, the questions that cannot be answered in the matrix should be marked with an 'X', meaning information is missing.
7. To investigate if the buildings in the drawings are RCFs, check hitta.se and Google Maps to compare their shapes. If the shapes do not look the same, make a note in the matrix, and we will discuss the drawings. Note! We only review drawings with the correct address and/or property designation. In case of doubt, the address is checked first and then we check which drawings have been sent to us. A search is made on the Internet for 'name of RCF' and 'city', then it is settled if we have received correct material. In addition, if the number of buildings on the plot differ between the drawings and the online map services (hitta.se or Google Maps), the information from hitta.se and Google Maps is prioritised, and the drawings cannot be used in the review. In such cases, only Hitta.se and/or Google Maps is used for the review, and only zones 3 and 4 are completed in the matrix. If you find that an address is incorrect and does not belong in the matrix (i.e. it is not an RCF for older adults), write a comment about it in Column F. Interesting design examples that somehow stand out are collected in the document 'Interesting examples'.
8. Select relevant drawings, usually termed '*situationsritning*' (situation drawing), '*planritning per våningsplan*' (floor plan drawing), '*fasadritning*' (facade drawing) and '*bygglovsritning*' (building permit drawing). This review is primarily digital. If the drawings are difficult to interpret digitally, they are printed

(A3 format) and reviewed via hard copy. Be observant of whether building extensions have been completed. If so, it is necessary to review both the original drawings and extension drawings. That is, it is insufficient merely to review the latest version of drawings as, for example the main building may not be included. Use at most five minutes per RCF to investigate if the drawings are correct, readable and useful. If more than one building is on the plot, use a maximum of 10 minutes to sort drawings. If you need more time, make a note, and we will discuss it later.

9. Sort the drawings based on floor plan so the review can be carried out smoothly.
10. If you think the review will be facilitated by marking on drawings (hard copy or digital), it is fine.

Phase 2: Conducting the review (Steps 11-52)

11. If the drawings are printed, the review is facilitated by placing them on a large table so several drawings can be viewed simultaneously.
12. Open the review matrix in Excel. The matrix contains the variables for which the drawings will be examined. Initially, the assessment concerns background information. Subsequently, the review is categorised based on the model of four zones of contact with the outdoor environment. There are several answer options for each column. It is important that the available options are used correctly.

Starting

13. Column A (name of municipality): Locate the municipality you will review. Column A is preloaded and does not require processing.
14. Column B (name of RCF): Find the right row for the RCF in the matrix. Addresses for all RCFs are preloaded in columns C–E.
15. Column F (map): Visit the website www.hitta.se, and find the RCF on the map. Enter the name and city for the RCF in the search field. Copy the weblink showing the location of the RCF and insert it in Column J. Purpose: To facilitate review during the procedure, note the appearance of the plot and the location of the building(s).
16. Column G (map): Visit the website www.googlemaps.com, and find the property on the map. In the search bar, type the name and city of the property. Copy the link showing the location of the property and insert it in Column H. Purpose: To facilitate review during the procedure, take a digital walk around the plot to get a better idea of the building and its location.
17. Column H: Comments are used to write special circumstances regarding the drawings. For example, some drawings are missing/large number of drawings/the address is not an RCF.
18. Columns I–J (municipal grouping classification) are pre-loaded and do not need further processing. Use the Excel file *Kommungruppsindelning 2023* and register options for each municipality.
19. Column K (organiser) is information obtained via the Swedish National Board of Health and Welfare.

20. Column L (approved building permit year): Note which year the building permit was approved (i.e. the year indicated in the drawing). If there are different drawings with different years, pick the latest year indicated.
21. Column M (approved building permit decade): This number is based on the previous data and is calculated automatically via formula.

Background questions

22. Column N: How many floors are in the building? Enter the number of floors in the RCF building. Usually, the basement and the attic are excluded, unless they include apartments, common rooms, dining rooms or living rooms that belong to the RCF. The same goes for hillside houses. All floors with apartments, common rooms, dining rooms or living rooms that belong to the RCF count. The information is gathered from drawings, hitta.se or Google Maps. Fill in the answers based on the specified options. Available options: 1 = 1 floor, 2 = 2 floors, 3 = 3 floors etc. and X = Information is missing.
23. Column O: How many assisted living apartments are in the building? Count the number of apartments according to the drawings. (Note that an apartment counts as one, even if there is more than one person living in it.) Information from drawings. Fill in the answers based on the specified answer options. Available options: 1 = 1 apartment, 2 = 2 apartments, 3 = 3 apartments etc. and X = Information is missing.

Zone 1

24. Column P: Are windows/French balconies in contact with the outdoor environment in the common rooms (e.g. activity room, meeting room, therapy room, café, spa or library)? Information from drawings. Note the occurrence/absence, and enter answers based on the specified alternatives. Available options: 0 = No, 1 = Yes, 2 = Partial (available in some, but not all), 3 = No common rooms and X = Information is missing.
25. Column Q: Are windows/French balconies in contact with the outdoor environment in dining areas and living rooms/day rooms? Information from drawings. Note the occurrence/absence, and enter answers based on the specified alternatives. Available options: 0 = No, 1 = Yes, 2 = Partial (available in some, but not all), 3 = No dining areas and living rooms/day rooms and X = Information is missing.
26. Column R: Are windows/French balconies in contact with the outdoor environment in the apartments? Information from drawings. Note the occurrence/absence, and enter answers based on specified alternatives. Available options: 0 = No, 1 = Yes, 2 = Partial (available in some, but not all) and X = Information is missing.
27. Column S: Are windows/French balconies in contact with the outdoor environment in the conference rooms? Information from drawings. Note the occurrence/absence, and enter answers based on specified alternatives. Available

options: 0 = No, 1 = Yes, 2 = Partial (available in some, but not all), 3 = No conference room and X = Information is missing.

28. Column T: Are windows/French balconies in contact with the outdoor environment in the care workers' room/dining rooms? Information from drawings. Note the occurrence/absence, and enter answers based on specified alternatives. Available options: 0 = No, 1 = Yes, 2 = Partial (available in some, but not all), 3 = No care workers' room/dining room and X = Information is missing.
29. Column U: Are windows/French balconies in contact with the outdoor environment of the offices? Information from drawings. Note the occurrence/absence, and enter answers based on specified alternatives. Available options: 0 = No, 1 = Yes, 2 = Partial (available in some, but not all), 3 = No office and X = Information is missing.
30. Column V: Are windows/French balconies in contact with the outdoor environment in care workers' relaxing rooms? Information from drawings. Note the occurrence/absence, and enter answers based on specified alternatives. Available options: 0 = No, 1 = Yes, 2 = Partial (available in some, but not all), 3 = No relaxing room and X = Information is missing.

Zone 2

31. Column W: Are there any entrances to the outdoor environment (excluding delivery entrances/entrances to garbage rooms)? Information from drawings, hitta.se or Google Maps. Note the occurrence/absence, and enter answers based on specified alternatives. Available options: 0 = No, 1 = Yes and X = Information is missing.
32. Column X: How many patios/balconies/glazed balconies/glazed conservatories for older adults are directly connected to the building? Information from drawings, hitta.se or Google Maps. Zone 2 on the ground floor is counted a) When there is a door and a marking on the ground with the label '*uteplats*' (patio), b) When there is a door and an area right outside the door with a clear framing (e.g. hedges) or c) If there is a patio door between the indoor and outdoor environment, then we assume that there is some form of useful outdoor environment outside. Balconies are counted when there is a door leading to a clearly framed area. The label '*balkong*' (balcony) is not necessary. In some RCFs, there are balconies with fire ladders. If the site looks as if it is used as a balcony, include it in the review; if not, exclude it. Fill in the answers based on the specified options. Available options include the following: 1 = 1 patio/ balcony/glazed balcony/glazed conservatory, 2 = 2 patios/balconies/glazed balconies/glazed conservatories, 3 = 3 patios/balconies/glazed balconies/glazed conservatories etc. and X = Information is missing.
33. Column Y: How many apartments per patio/balcony/glazed balcony/glazed conservatory are there? The answer is based on columns O and X and is calculated automatically via the formula.
34. Column Z: How many patios/balconies/glazed balconies/glazed conservatories for care workers are directly connected to the building? Information from

drawings, hitta.se or Google Maps. Zone 2 on the ground floor is counted a) When there is a door and a marking on the ground with the label 'uteplats' (patio), b) When there is a door and an area right outside the door with a clear framing (e.g. hedges) or c) If there is a patio door between the indoor and outdoor environment, then we assume that there is some form of useful outdoor environment outside. Balconies are counted when a door leads to a clearly framed area. The label 'balkong' (balcony) is unnecessary. Some RCFs have balconies with fire ladders. If the area seems useable as a balcony, include it in the review; if not, exclude it. If the patios/balconies/glazed balconies/glazed conservatories relate to a door to conference zoom, office, staff room/dining room or relaxing room, we consider them useful for just the staff. Fill in the answers based on the specified options. Available options include the following: 1 = 1 patio/balcony/glazed balcony/glazed conservatory, 2 = 2 patios/balconies/glazed balconies/glazed conservatories, 3 = 3 patios/balconies/glazed balconies/ glazed conservatories etc. and X = Information is missing.

35. Column AA: How many greenhouses/orangeries/independent conservatories are there? Information from drawings, hitta.se or Google Maps. Note the number based on the answer options specified. Available options: 1 = 1 greenhouse/orangery/independent conservatory, 2 = 2 patios/balconies/glazed balconies/ glazed conservatories, 3 = 3 patios/balconies/glazed balconies/glazed conservatories etc. and X = Information is missing.
36. Column AB: How many roof terraces are there? Information from drawings, hitta.se or Google Maps. Note the number based on specified answer alternatives. Available options: 1 = 1 roof terrace, 2 = 2 roof terraces, 3 = 3 roof terraces etc. and X = Information is missing.

Zone 3

37. Column AC: How many square metres are in the plot (including the building/s)? Information from eniro.se. Note the plot size in square metres. X = Information is missing.
38. Column AD: Based on the previous column, what is the plot size range (including building/s)? The answer is based on Column AC and is calculated automatically using the formula.
39. Column AE: Is an outdoor environment on the ground floor directly connected with the RCF on the plot? Information from eniro.se and/or lantmateriet.se. Note if there is an outdoor environment on the ground floor directly connected to the RCF on the plot or if the building covers the entire property designation area (i.e. plot size area and lacks its own defined Zone 3), if the RCF lacks its own defined Zone 3 (i.e. is in Zone 4, e.g. on public land) and if the property is shared with other/s (i.e. if the plot is shared with companies or other kinds of facilities that are registered on the address, including schools, healthcare facilities etc.). Note the occurrence/absence or combinations and fill in answers based on the specified alternatives. Available options: 0 = No* Building covers the entire property designation area, that is plot size area (and is without its own defined Zone 3). 1

= No* Building covers all the property designation area, that is plot size (and lacks its own defined Zone 3) AND the property (address/building) is shared with other/s** (e.g. school, healthcare facilities etc.) – there are two or more companies registered on the address according to eniro.se. 2 = No* The RCF is in Zone 4, for example on public land (and is without its own defined Zone 3). 3 = No* The RCF is in Zone 4, for example on public land (and lacks its own defined Zone 3) and the address/building is shared with other/s** (e.g. school, healthcare facilities etc.) – there are two or more companies registered on the address according to eniro.se. 4 = Yes*. 5 = Yes*; however, the property is shared with other/s** (e.g. school, healthcare facilities etc.) – there are two or more companies registered on the site according to eniro.se. X = Information is missing. Information from *Lantmäteriet.se and/or eniro.se and **Information only available at eniro.se.

40. Column AF: How many square metres of the plot constitutes an outdoor environment with vegetation (e.g. a garden) rounded to tens of square metres, (including enclosed courtyards, excluding parking space and traffic routes)? Information from lantmateriet.se. Note the area of the yard, including courtyards (not roof terraces), but excluding hardscapes, such as parking areas and roads. Only measure areas of plots under 1 ha square metres (<10,000 square metres) according to Column AC and only for RCFs with answer Option 4 in Column AD (i.e. with a dedicated Zone 3 on the plot that is not shared with others). Enter square metres in numbers (rounded to the nearest tens). X = Information is missing. Z = Not measured – plot size exceeds 10 square metres (column AC) or the plot has no dedicated outdoor environment (according to the result in Column AE). Save the measurement as pdf - filename = 'line number column letters'.
41. Column AG: What is the size of the outdoor environment with vegetation (e.g. garden) per apartment? Based on columns O and AF, it is automatically calculated via the formula.
42. Column AH: How many building/s are on the plot (both connected and unconnected, excluding pavilions, sheds etc.)? Information from lantmateriet.se. Note the total number of building/s on the plot (both connected and unconnected), excluding pavilions, sheds etc. Fill in based on the specified answer alternatives. Available options: 1 = 1 building, 2 = 2 buildings, 3 = 3 buildings etc. and X = Information is missing.
43. Column AI: How many enclosed courtyards are on the plot? Information from lantmateriet.se. Note the number of enclosed courtyards based on the specified answer alternatives. Available options: 1 = 1 enclosed courtyard, 2 = 2 enclosed courtyards, 3 = 3 enclosed courtyards etc. and X = Information is missing.
44. Column AJ: How many open courtyards are on the plot? Information from: lantmateriet.se. Note the number of open courtyards based on the specified answer alternatives. Available options: 1 = 1 open courtyard, 2 = 2 open courtyards, 3 = 3 open courtyards etc. and X = Information is missing. Guiding rules are to include courtyards with house angles that are closed more than 85 degrees, for example with openings shaped similar to C, E, F, G, H, U and V. However, disregard house angles that are L shaped or more open (90 degrees and more).

45. Column AK: How many courtyards are on the plot (both enclosed and open courtyards)? The answer summarises the results of columns AI and AJ. The result is calculated automatically using the formula.

Zone 4

46. Column AL: What kind of environment surrounds the RCF? Information from lantmateriet.se. Note the type of environment/settings that surround the RCF (beside the property designation area). Fill in the answers in columns AM–AW based on specified alternatives for built-up area/surrounded by enclosed building blocks, built-up area/surrounded by high building, built-up area/surrounded by low buildings, built-up area/sparsely populated area, beside open land/park (developed area, including sport facilities), beside farmland/agricultural landscape, beside developed or natural landscape with high vegetation, that is high bushes and trees, beside water (sea, lake, river or canal), beside industrial and/or commercial area, beside heavy transport infrastructure (e.g. multi-lane highway, communication hubs with railways, bus and/or train station etc.) and beside a public building, societal function (e.g. care facilities, schools, graveyards etc.). Available options: 0 = No, 1 = Yes and X = Information is missing.
47. Column AY: Is there a public outdoor environment in the immediate neighbourhood within a radius of approximately 300 metres from the main entrance? Information from lantmateriet.se. Identify the occurrence of specific visiting points (supporting different types of experiences) in the closest environment. State for each category if it is present within 300 metres walking distance from the RCF. A distance of 300 metres is estimated using the measuring tool on the property map. Fill in the answers in columns AZ–BD based on specified alternatives for public open space (including cemeteries, disregarding schoolyards), public areas intended for physical activity (disregarding sport areas in schoolyards), public areas with high vegetation (park, path and forest), public areas with water contact and a square (clear square/path that is marked on the map). Available options: 0 = No, 1 = Yes and X = Information is missing.

Ending

48. Column BE (property designation): Information from lantmateriet.se. Register '*Fastighetsbeteckning*' (the Swedish property designation code) for the property/plot where the RCF is located.
49. Column BF (search link): Information from lantmateriet.se. Copy and paste the link to the search hit at minkarta.lantmateriet.se.
50. Column BG (save verified address): Information from lantmateriet.se. Copy and paste the address row from the search hit on the map.
51. Column BH (national county division): Information from Statistics Sweden (link: https://www.scb.se/hitta-statistik/regional-statistik-och-kartor/regionala-indelningar/lan-och-kommuner/lan-och-kommuner-i-kodnummerordning/). Add information about which Swedish county the municipality belongs to.

52. Column BI (climate zones): Information from Impecta (link: https://www.impecta.se/sv/zonkarta). Add information about which climate zone to which the respective county belongs. If a county is divided into two or more climate zones, choose the option that represents the largest area.

Phase 3: After the review (Steps 53-55)

53. Review of new RCF begins according to the procedure described in the manual.
54. The review of a new municipality begins according to the procedure described in the manual.
55. When all municipalities and RCFs have been reviewed, send the matrix and the document with interesting design examples to the research group.

Phase 4: Random checks (Step 56)

To ensure the quality of the assessments of access to the outdoor environment at RCFs, the research group decided to perform random checks of the data. This section describes how the process works. Two research assistants in the study were responsible for assessing access to outdoor environments. Random checks were conducted by other persons in the research group who had not performed the assessments. The assessments' results were compared with the random checks' results. In this way, the quality assurance of the assessments took place and any ambiguities or mistakes were caught. Interval: Random checks were taken for every 200 RCF. Instructions: A) Go to the matrix and find the specific RCF, B) Obtain current drawings and online maps, C) Carry out the sampling based on the process described above, D) Compare the results of the assessments with the results of the random check, E) In the case of similarities, no action needs to be taken, F) If there are a few differences (2–3 pcs), they are within the margin of error and contributed by the human factor. Thus, no measures need be taken. If differences concern a specific variable in the matrix, appropriate measures are taken to avoid systematic errors in the ongoing assessments, G) If there are several differences, the research assistants and control persons will be asked to redo the current assessment/random checks. If the differences persist, the whole research group will be invited to a meeting to discuss whether the questions' wording is ambiguous or whether there are mistakes in the assessments. If differences concern a specific variable in the matrix, appropriate action is also taken, and H) Appropriate measures are decided upon with the research group.

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