



University of Pécs
Faculty of Engineering and Information Technology
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Design for Health

Creating supportive environments for people living with Dementia

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“To be a patient describes an experience that deserves respect. We will all be patients at some stage and this is part of what it is to be alive.”

(Jim Lucey – “In My Room”)

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PREFACE

This doctoral thesis was developed due to personal motivations and a desire for a more egalitarian and empathic society. As an architect with a specialization degree in healthcare environments, my main aim was to use design and architecture to enhance the quality of life and well-being of patients, especially those with dementia.

During my doctorate journey, I joined multiple conferences, seminars and workshops related to the healthcare field in order to immerse myself in the topic. Still, a great amount of time was dedicated to acquiring knowledge in all aspects of dementia disease, which I chose to be the main area of study for my DLA.

In the process, I even had the opportunity to hear people with dementia themselves on several occasions.

“My diagnosis doesn’t define who I am!” – said a man living with dementia during a webinar. According to him, dementia has a diagnosis of exclusion and in many situations, people with dementia are treated as victims and sufferers, not as human beings. *“They stopped seeing me long before I stop seeing me.” – the man also mentioned.* According to Zeisel (2010) – founder of The Hearthstone Institute & The I’m Still Here Foundation - it is easy to classify those living with Alzheimer’s for many years as non-people because they might no longer relate to the world the same way they used to, or as we think we do. Understandably, dementia shaves memories of a lifetime and it can also affect the sense of identity. However, it does not mean that they should not be treated as human beings.

The more I got to know about people with dementia, the more I was sure about the decision of my main topic. My first step was to analyze the current literature situation and state of art regarding people with dementia in studies related to the physical environment. My most relevant scientific publication entitled “People with Dementia as Active Participants in Studies Related to the Built

Environment: A Systematic Review” (2021), reinforces the fact that people with dementia offer a valuable contribution when are actively included in scientific studies.

It is necessary to highlight that during my doctoral studies, we came across the outbreak of the COVID-19 pandemic in early 2020, which affected our lives brutally and unexpectedly. While the pandemic directly affected the research resources and timeline, it also put in evidence its protagonist: The elderly. Considered to be one of the highest-risk groups during the pandemic, measures were needed to ensure that their lives were secured.

Another additional value to the importance of the current study is the fact that people with dementia are threefold higher than those without a diagnosis of any type of dementia of contracting COVID-19, also with a higher risk associated with the development of a serious form which can lead to hospitalization (Numbers & Brodaty, 2021). Society, in general, became more aware and conscious of the most fragile.

According to Alzheimer Europe (2021), the pandemic has created additional barriers in the delivery of services and support for people with dementia, as well as creating additional challenges in maintaining dementia as a priority issue in the eyes of policy and decision-makers For this reason, some ideas and practices had been modified in order to make it possible the development of the doctoral dissertation research.

I truly believe this interdisciplinary study will be a great addition to the knowledge in the healthcare and architecture field, moreover, a contribution to studies related to the dementia disease field.

ABSTRACT

Buildings in general, including nursing homes for the elderly, are usually not designed to take into consideration the impacts of dementia on people's life. This dissertation contains information on the development of guidelines of design principles and aspects while designing for people with dementia. The general objective of this study is to improve the lives of people with dementia by guiding designers and architects on creating/adapting environments that increase people with dementia's capacity to be more independent and self-confident in their daily lives. After an extensive literature review and case study analysis with a qualitative approach using Content Analysis research method, it was possible to identify and categorize the dementia symptoms that can impact how individuals relate to the environment, as well as design principles and design aspects that should be adopted in the environment for people with dementia. As a concrete outcome, an adaptation guideline was published online in a visually appealing format, making it readily accessible to the public.

Keywords: Architecture for dementia, Healthcare environments, Design guidelines, Alzheimer's disease

CHAPTER 1:
INTRODUCTION



Image source: Pixabay

The ageing of the world population is seen as one of the greatest social accomplishments of the 20th century. Demographic change is an important issue in many regions in Europe. The increase in life expectancy and a constantly low birth rate are the main causes of ageing societies. According to the UN World Bank., (2019), new measures and concepts of population ageing have significant implications for assessing the living conditions and living arrangements of older persons, as well as their productive and other contributions to society and their needs for social protection and health care. However, it is important to highlight that although there is a high number of active elderly people with preserved functional

capacity, there is also a prevalence rate of patients with chronic neurodegenerative diseases such as dementia.

Dementia is a disease in which there is a deterioration in cognitive function beyond what might be expected from normal ageing (Halsall & MacDonald, 2015; World Health Organization, 2012). The prevalence of dementia is less than 1% before the age of 65 increasing to 25% by the age of 90 (Halsall & MacDonald, 2015). Besides age, there are other risk factors which may increase an individual's vulnerability to acquire dementia. According to Halsall & MacDonald (2015) among these factors are: Family history of dementia including a genetic history; down's syndrome, cardiovascular problems; lifestyle factors - unhealthy diet, lack of physical activity, smoking, high levels of alcohol consumption, social isolation and head injury.

Generally, dementia is diagnosed when there are multiple cognitive impairments (Halsall & MacDonald, 2015). The disease is a complex and multi-faceted condition that impacts each individual differently. Memory loss is a common symptom associated with Alzheimer's disease (Evans et al., 2019), however, dementia often includes perceptual and visuospatial problems which can lead to agitation, disorientation and distress (Waller & Masterson, 2015). Dementia typically presents as a progressive decline in cognition and social functioning. However, it can also have a sudden onset (Halsall & MacDonald, 2015).

The diagram bellow explains graphically how the progression of dementia happens and, as Perrin et al. (2008) wrote in the book *"Wellbeing in Dementia: An Occupational Approach for Therapists and Carers"* how the patient loses sight of their surrounding environment over time.

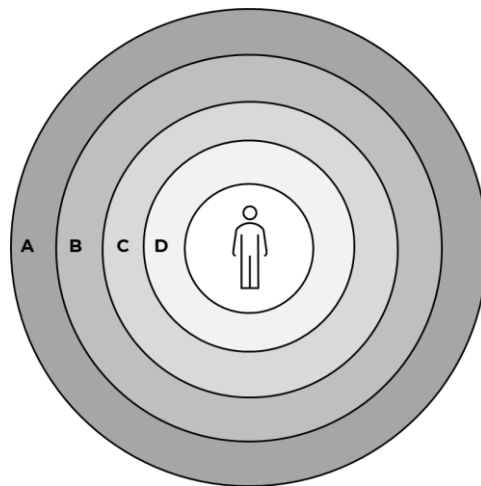
According to the author, in the first stage the person with dementia loses sight of A, which is the wider environment, it may consist of the town where the person lives, or distant friends and relatives or perhaps peripheral projects that are not particularly meaningful. With the advance of the disease, the person fails to perceive B as well as A, which can be the layout of his son's house, his new-born granddaughter, the model railway he was building in the spare room. Later on, the patient will be unable to perceive A, B and C, this is the stage where the person with

dementia will get lost at their own house, fail to recognize closer friends and relatives.

“We would not therefore perceive this increasing egocentricity as purely a turning-in on oneself; rather, that the external world for the dementing person is changing, and is in a very real sense shrinking.” (Perrin et al., pp.51-52, 2008)

When the stage advances in which A, B, C and D no longer exist in any significant way for the person with dementia, the person might indeed be encased in a sort of glass shell and can only operate within its confines.

Diagram 1. Sights of Dementia



The lack of public awareness and understanding of the disease creates a stigma around people with dementia (World Health Organization, 2012). According to Zeisel (2010) people living with Alzheimer’s should be treated as people rather than as patients, they should be appreciated for their capabilities as well as their losses. It is important to see the person besides the illness and employ as many nonpharmacological treatments as pharmaceutical ones (Lee et al., 2017; Sloane et al., 2002; World Health Organization, 2012).

Although people living with dementia have been perceived to be incapable of eliciting their accounts because of verbal communication disability and memory deficits (Nygård, 2006), recent studies can prove otherwise (Hellstrom et al., 2007). World Health Organization (2012) states that they often have unique insights into

their condition and life, and it is important to highlight that aside from a disturbance of multiple higher cortical functions, consciousness is not clouded in dementia disease.

DATABASE

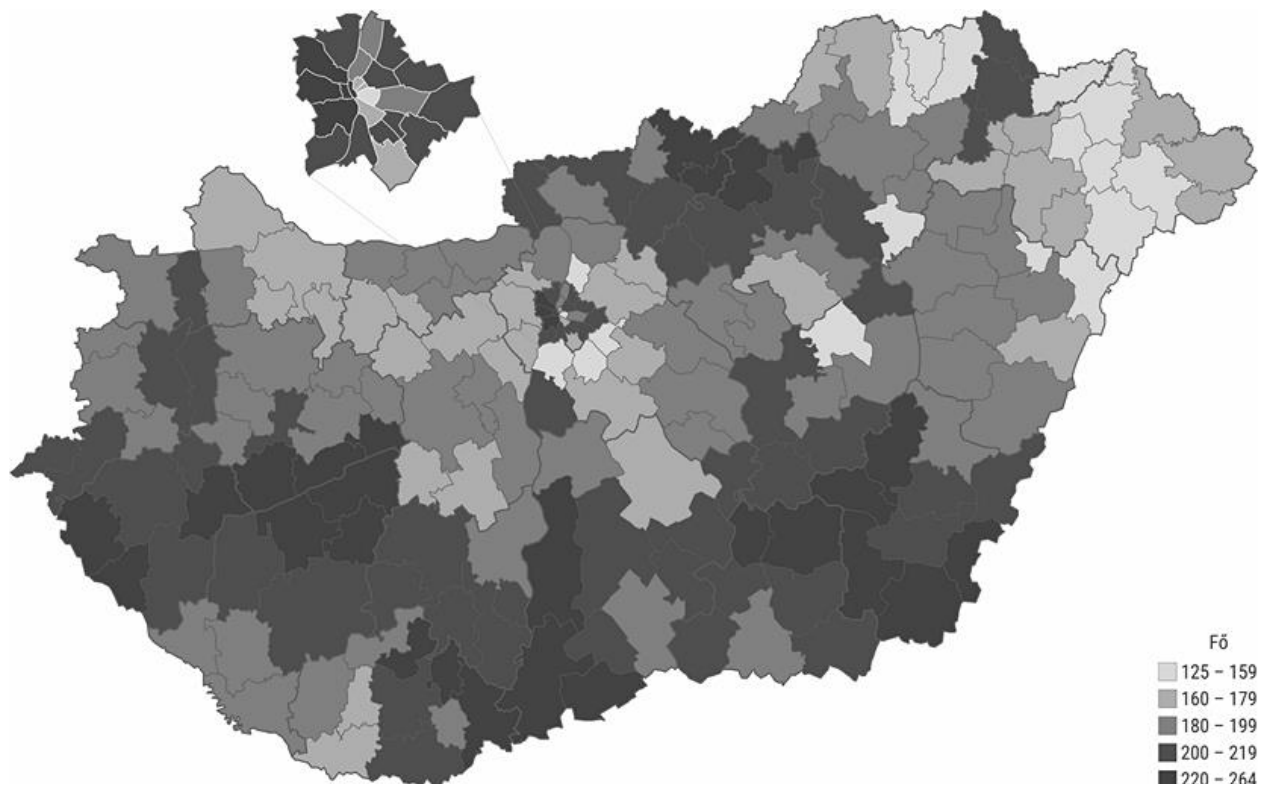
It is estimated that 50 million people live with dementia worldwide. There is a prediction that this number will increase significantly (Alzheimer Europe, 2019), with a prediction to more than triple by the year of 2050 (World Health Organization, 2012). Alzheimer's disease is the most common form of dementia, and it possibly constitutes around 60 to 70% of the cases. Currently, the disease has no cure, and it is a continuous process. It is important to clarify that although this illness mainly affects elderly people, it is not a normal part of ageing (World Health Organization, 2012). Nonetheless, the risk of developing the disease increases with age. The World Health Organization (2017) predict that 5-8% of the general population aged 60 and over will develop dementia at some point.

To provide a rationale for developing this project in Hungary, it was deemed pertinent to incorporate a database detailing the country's current situation regarding the topic. Among 28 countries from European Union¹ in 2018, Hungary occupy the 13th position in the prevalence of Dementia (Alzheimer Europe, 2019). According to Gyarmati (2019), the burden of social care in Hungary is constantly increasing. Statistics from Központi Statisztikai Hivatal (KSH) is that 19.3% of the population in Hungary has over 65 years old which is around 1.8 million people. However, only 3% of elderly people have access to specialist care in a nursing home, the waiting lists number more than half of those already in care institutions (Gyarmati, 2019).

KSH (2021) mentions that particular attention should be paid to the ageing southern and south-western regions of the country, as well as to certain districts of the capital, where the proportion of the elderly population exceeds the national average. In *figure 1* it is possible to observe the distribution of elderly people per district in Hungary.

¹ United Kingdom included.

Figure 1. Number of people aged over 65 years per thousand inhabitants per district in Hungary

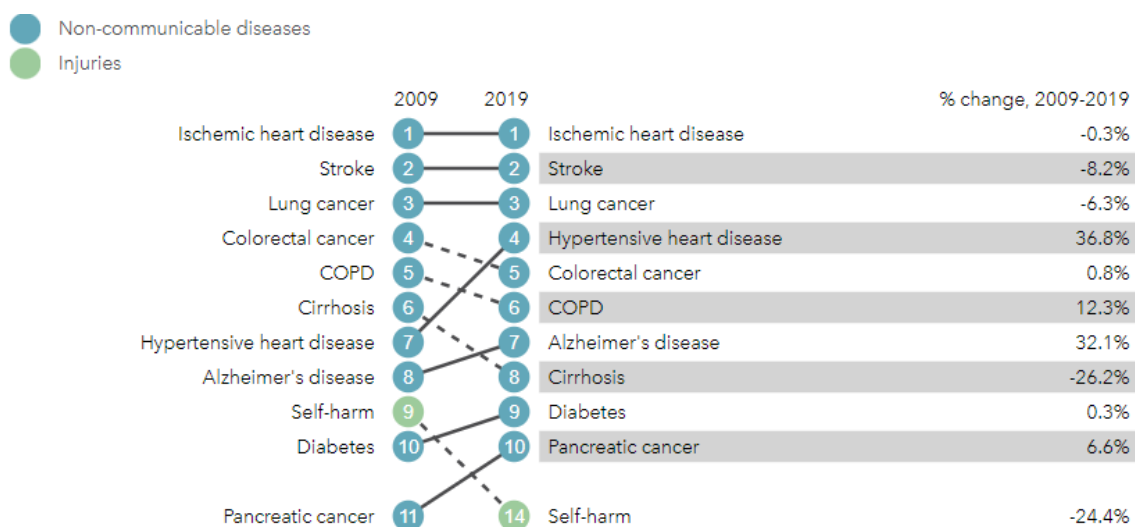


Source: KSH statistics

Alzheimer Europe (2019) estimates a slight decrease in Hungary's population for the period between 2018 and 2025, followed by a stronger decrease between 2025 and 2050. From 9.7 million total inhabitants in 2018, it is expected that by 2050 the inhabitant number will be around 8.4 million. Despite the decrease in population, the overall number of people with dementia will rise from 1.49% of the entire population in 2018 to 2.64% in 2050.

According to the Institute for Health Metrics and Evaluation (IHME), Alzheimer's disease is the 7th main cause of death in Hungary in 2019, it had an increase of 32.1% compared to 2009. In *figure 2* it is possible to get an overview if the main causes of death in the country in 2009 compared to 2019.

Figure 2. Ranking of main causes of death in Hungary in 2009 and 2019



Source: IFHME

BUILT ENVIRONMENT AND DEMENTIA

It is widely acknowledged that individuals maintain a distinct relationship with their environment. The environment in which individuals reside and operate, holds considerable influence over their physical and psychological well-being. (Waller & Masterson, 2015) and it is the same with people with dementia. In fact, the design of the physical environment is increasingly recognized as an important aid in caring for people with dementia (Day et al., 2000). The indications are that architecture does have an impact on the well-being of people with dementia, and this can be positive when space supports and enables activity or negative when it curtails or restricts (Torrington, 2006). People suffering from this illness are extremely limited in their daily competence and need increased support for their daily life (Marquardt & Viehweger, 2014).

“Good design for dementia is good design for all” (Waller & Masterson, 2015).

There is good evidence that minor aids and adaptations can improve a range of outcomes for older people in general, increasing the levels of confidence and autonomy (Evans et al., 2019). Thoughtful design or/and adaptation of the physical environment can reduce hospital admissions for avoidable conditions such as falls

and urinary tract infections, which remain some of the most common reasons for hospital admissions among the elderly (Evans et al., 2019).

This research finds its justification in the awareness of dementia disease and its relationship with the built environment. The main goal is to gather information on how architecture can be used to support the life and well-being of people with dementia. Despite the importance of the topic for our society, it is still a relatively neglected field of study. Furthermore, this study identifies and investigates aspects of the built design that are relevant for people with this condition.

The general objective of this study is to improve the lives of people with dementia by guiding designers and architects on creating/adapting environments that increase people with dementia's capacity to be more independent and self-confident in their daily lives.

Among the specific objectives are:

- Analysis of the current state of the art on the topic.
- Identification of symptoms of dementia that impacts the relationship with the environment.
- Identification and categorization of design principles and design aspects that should be adopted in the environment for people with dementia;
- Development of guidelines to support designers and architects to create and/or adapt spaces able to increase the people with dementia quality of life.
- Contribution to the growing body of research on dementia care and to dementia awareness, especially regarding the design of built environments.

METHODS

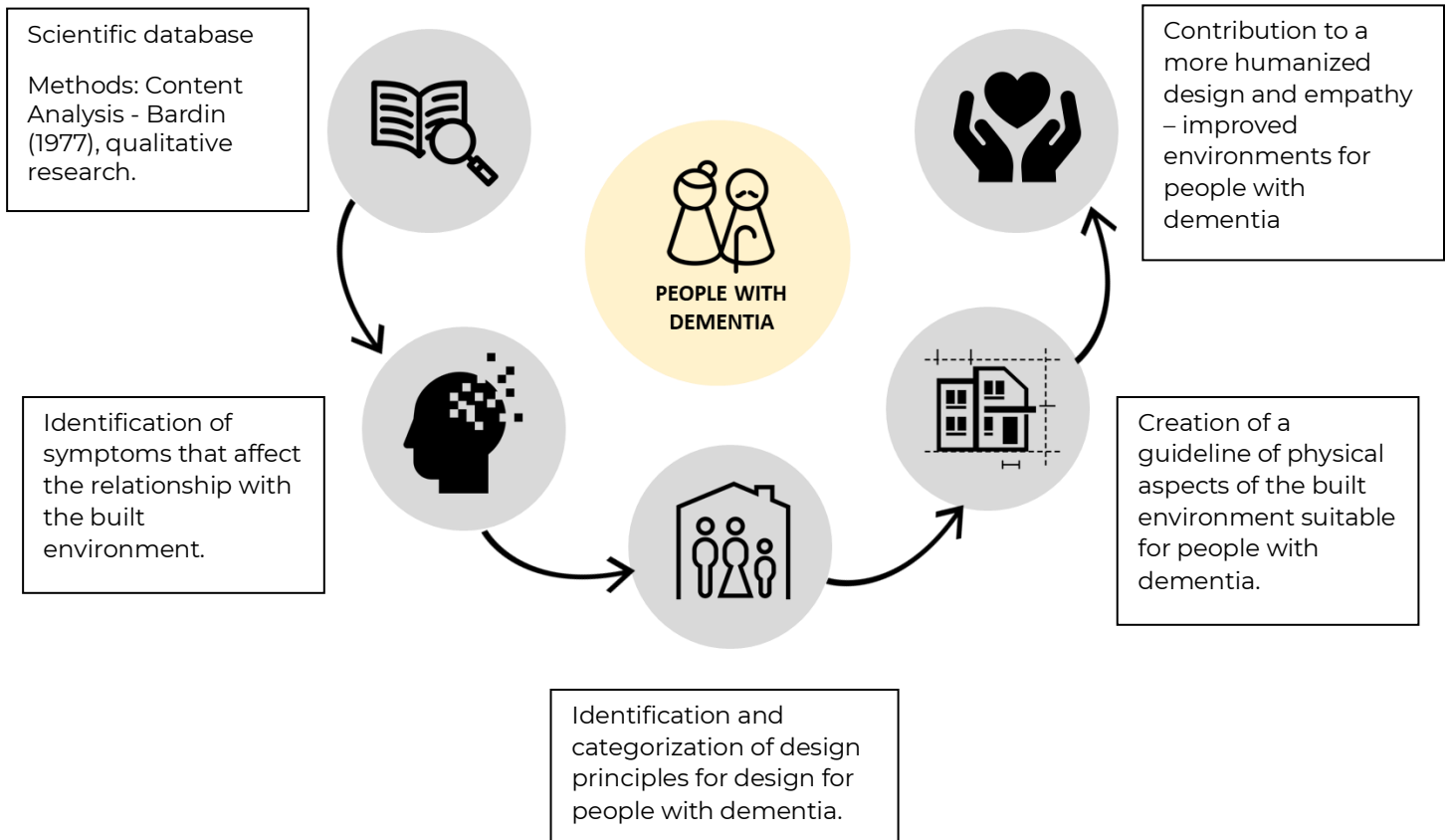
The current study has an interdisciplinary approach. A literature review was conducted considering evidence from environmental psychology, sociology, architecture, interior design, and healthcare fields. The knowledge resulting from the analyzed studies, combined with case studies analysis, was applied in the development of the masterpiece. The masterpiece contains an environment design guideline for environments for people with dementia and its application in a project.

The research was carried out using data collection methods and techniques based on qualitative research, which is characterized by the search for a detailed understanding of the meanings and situational characteristics (Richardson, 1999). According to Bardin (1977) qualitative analysis uses the frequency with which certain characteristics of the content appear as relevant information for the research.

The design guide was developed based on the combination of Content Analysis method, developed by Bardin (1977) from the literature review, case study analysis and participation in several conferences and seminars on the dementia topic. According to Bardin (1977), content analysis is performed in three different stages. Starting with a pre-analysis, followed by the exploration of the material and, finally, treatment of the results. In the pre-analysis stage, the documents that will be submitted to analysis are selected, hypotheses and objectives are formulated as well as the indicators that support the final interpretation. In this study, the analysis of the collected data was carried out from the frequency in which certain elements appeared in the literature review. These elements then were separated into thematic categories. Adopting this method, we could identify and categorize the following: symptoms of dementia that might impact the relationship between the person and the built environment, design principles for dementia and physical aspects of the design when designing for people with dementia.

The main goal was to give a clearer understanding of the challenges faced by those living with dementia and to explore how design can help solve or support those issues.

METHODOLOGY PROCESS



STATE OF ART

Compared with many other fields, designing for people with dementia does not have a large knowledge base (Fleming et al., 2020). Pulling together a global description of the state of the art on this topic was not a simple task. Although design for dementia has been a relatively neglected topic in the past years, during the course of this study - which started in 2018 - several new scientific articles and projects in the field were often published which required an up-to-date approach.

It is important to mention that there are many different sets of principles developed by different experts in different time frames. During the literature review, it was possible to find information about a set of environmental design principles in a paper published by Fleming & Bowless in 1987 in Australia. These principles - which were revised during the course of time - are still valid. They were developed by the work of Professor Richard Fleming and Kirsty Bennett at the University of Wollongong. The latest revision was made in October 2021 by The Design Dignity Dementia Team² and constitute of, as it follows:

- *Begin each project by developing a vision for a dignified way of life for people living with dementia.*
- *Where safety measures are agreed to be appropriate, design them to be as unobtrusive as possible.*
- *Design the environment to reflect a human scale.*
- *Plan the environment to make it easy for people to see and move where they want to go.*
- *Optimise stimulation.*
- *Promote movement, engagement, and meaningfulness.*
- *Afford people opportunities to enjoy contact with nature.*
- *Design all components of the environment to be as familiar as possible.*
- *Afford people opportunities to choose to be alone or with various size groups of people.*
- *Provide easy access and connection to and from local communities, families, and friends.*

For the current study, it was decided to apply these principles as the base knowledge. However, as mentioned before, these are not absolute principles.

It was included in the literature review published papers from several countries and institutions. Furthermore, the countries with more accessible English published information regarding research in the design and dementia field, were

² Richard Fleming, John Zeisel, Kirsty Bennett, Jan Golembiewski, Kate Swaffer, and Lynda Henderson. <https://designdignitydementia.com/manifesto-2>. Accessed on 19th of February, 2023.

found in studies from Australia, United Kingdom, United States of America, Netherlands, Canada, Germany, and Belgium. Among the institutions and groups, the works of the University of Stirling - Dementia Services Development Centre (DSDC), Alzheimer's Disease International (ADI), Dementia Lab research and MinD - Designing for People with Dementia³ project, should be emphasized.

³ The MinD project officially finished in February 2020, and now its activities continue through the MinD network.

Table 1. Summary of case studies analysed

	THE FIVE GARDENS (DE FEM HAVER)	ABBEYFIELD WINNERSH	CARPE DIEM DEMENTIA VILLAGE
LOCATION	Lier, Norway	Winnersh, UK	Dønski, Norway
ARCHITECTS	C.F. Møller Architects	Edmund William's Architects, PCR Group	Nordic Office of Architecture
YEAR	2013	2013	2020
PROJECT	Nursing home for patients with dementia	Nursing home for patients with dementia	Treatment and housing for patients with dementia
SIZE	10000 m ²	3360 m ²	18000 m ²
MAIN CONCEPT	Make wandering a positive experience for people with dementia	Support the residents in terms of wayfinding, community, and temporal orientation	Feel like a recognizable home rather than an institution
TYOLOGY	5 Integrated 3-story blocks with a courtyard	4 Integrated circular blocks with a courtyard leaning to the central hub	2-to-3-story buildings, small units, varied heights, and roof typologies

FIVE GARDENS NURSING HOME (2013)

This case study looks at a nursing home project to be located in Lier Kommune in Norway. The building has been designed for people living with dementia and has taken into consideration the symptoms and needs of those people. The Five Gardens consists of a 10000sqm building and it was developed by Møller Architects for the Lier Municipality.

Figure 3. Five Gardens Nursing Home

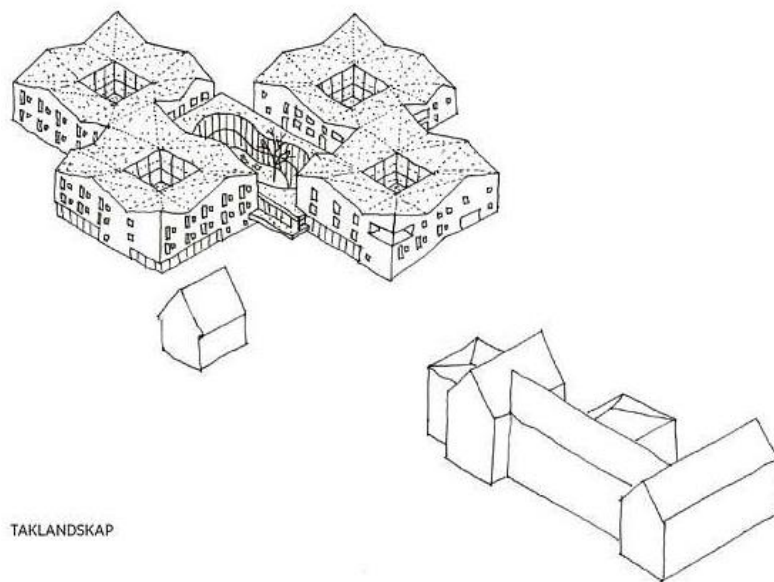


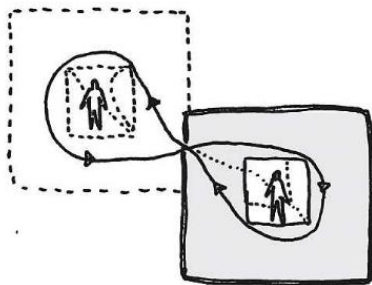
Image source: Møller Architects official website⁴

The plan consists of a cluster of four three-level edifices that are interconnected. The primary entry point and cafeteria offer access to all of the buildings. Each block of the construction features an internal verdant atrium and is linked to the central atrium, which serves as a common gathering spot for all occupants. The presence of five gardens guarantees that inhabitants are exposed to natural light, lush foliage, and the shifting seasons. This exposure infuses the core of the building with a sense of openness and fresh air.

⁴ Available at <https://www.cfmoller.com/>>. Accessed on 14 January 2022.

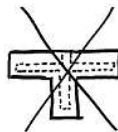
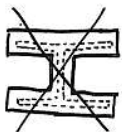
A prevalent sign of severe dementia is the compulsion to roam around aimlessly. It's noteworthy that the architects didn't attempt to curb this behavior, but instead, made it a delightful experience for the patients. Møller Architects aimed to create a positive wandering experience, which is why they avoided linear paths that could make the residents feel confined. Instead, the entire arrangement was conceived with circular patterns to allow for seamless movement.

Figure 4. Five Gardens Nursing Home preliminary study

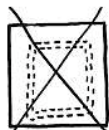
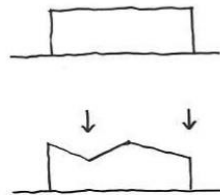


FLEKSIBEL BOENHET

Boenhetene er organiseret i en enhet med 8 rom og tilhørende felles funksjoner. Karakteristisk for boenheten er det sentrale atriumet.



Lange mørke ganglinjer og korridorer for personalet og beboere.



TYPOLOGIER

Sirkulært forløp om en mørk kjerne. Kortere ganglinjer for personalet og beboere.

Sirkulært forløp om et atrium. Kortere ganglinjer for personalet og beboere.

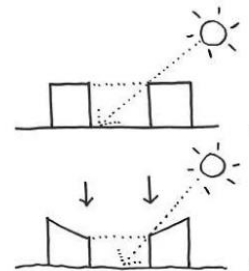
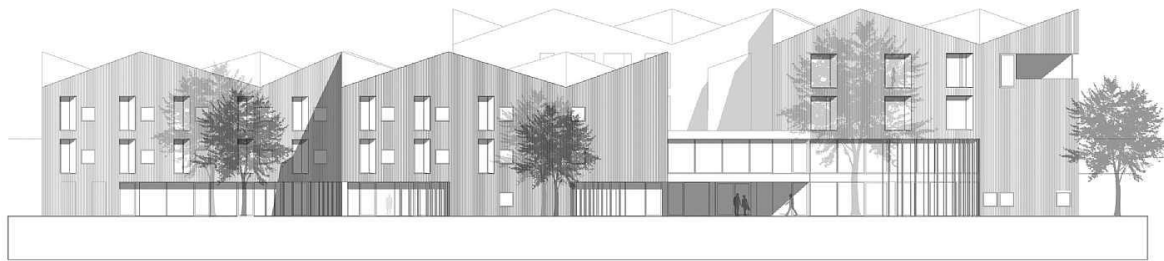


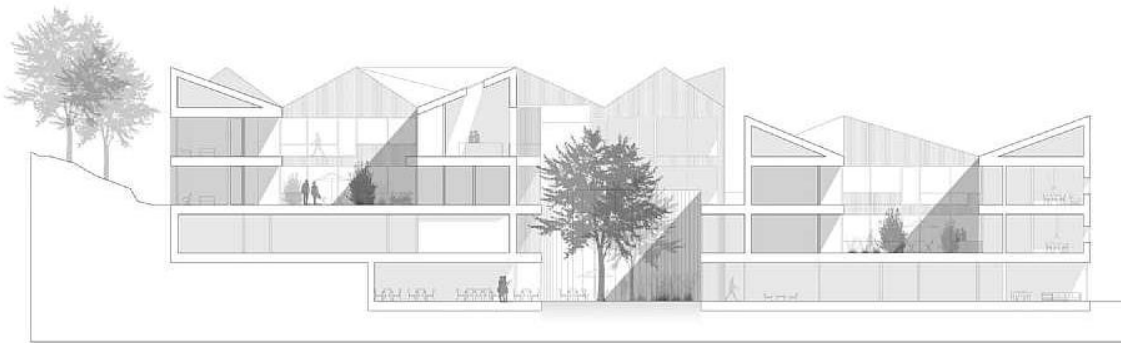
Image source: Møller Architects official website¹

People with dementia are often categorized under a one-read designation, although the disease course has several phases and different needs (Perrin et al., 2008). In this regard, the architects determined that each floor would be responsible for hosting patients in different phases of the disease. Every floor contains a distinct environment designed to meet the necessity of each phase in the progress of the disease, which required variation and flexibility in terms of accommodation and outdoor areas.

Figure 5. Five Gardens Nursing Home façade and section

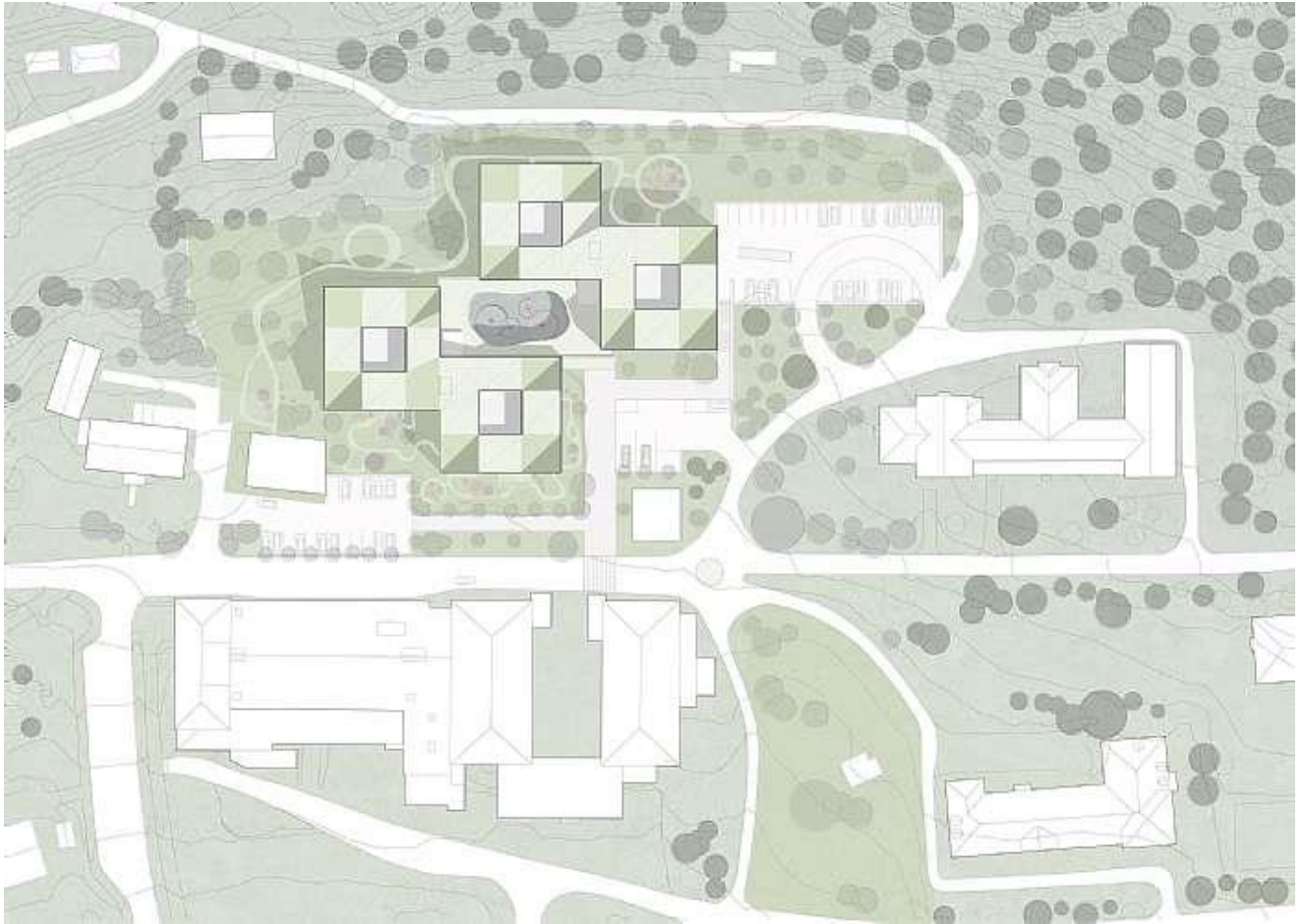


Source: Møller Architects official website¹



Source: Møller Architects official website¹

Figure 6: Five Gardens Nursing Home location plan



Source: Møller Architects official website¹

Figure 7: Five Gardens Nursing Home Perspectives



Source: Møller Architects official website¹

Figure 8: Five Gardens Nursing Home Bedroom



Source: Møller Architects official website¹

ABBAYFIELD WINNERSH (2016)

This case study consists of an award-winning purpose-built specialist aged care home at Winnersh in the United Kingdom. This care home has been designed as a centre of excellence for dementia care and has taken on board information and technologies for the treatment and support of dementia. The project design was developed by Edmund William's Architects and commissioned from the PCR group.

Figure 9: Abbeyfield Winnersh Perspective Sketch



Image source: © Housing Learning & Improvement Network

The design has a unique plan form of intersecting circular wings. The accommodations are arranged in 6 clusters, with an average of 10 people living in each. The resident's bedrooms are accessed from a circular path and each room on the ground floor has access to a garden space. According to the PCR⁵ group that moved the project from the planning consent to construction, the main principle of the design is for each cluster to develop a sense of social belonging in a small group of communal living.

It is interesting to note that the layout of the building evolves from understanding how older people with dementia interpret their environment and how the plan form and facilities should be arranged to provide comfort, security, and identity. The intersecting circles reflect the interaction of "cog-wheels" of the mind

⁵ Available at <http://www.prc-group.com/projects/abbeyfield-winnersh/>. Accessed on 10th of January 2022.

with the disorientation and uncertainty that might be created by the fluttering of a butterfly (Conrad & April, 2018).

Figure 10: Abbeyfield Winnersh Layout Analysis

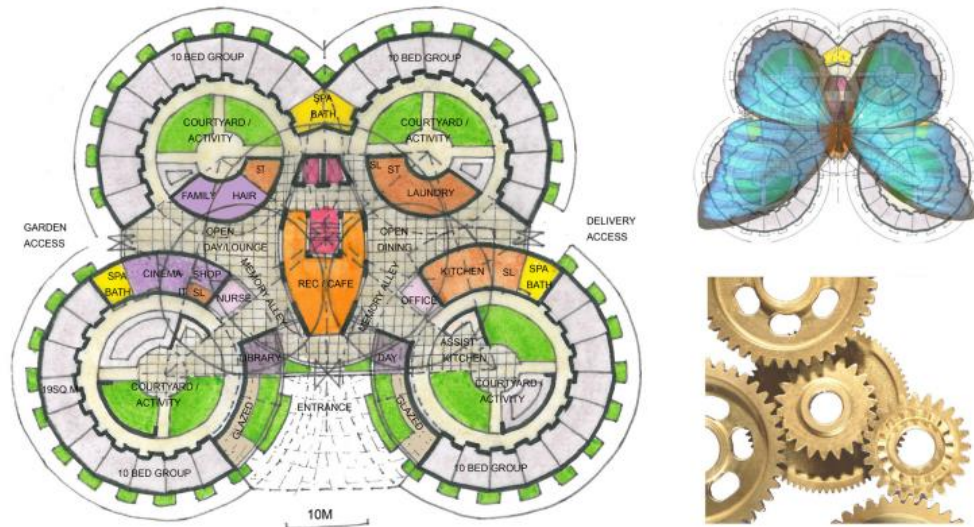


Image source: © Housing Learning & Improvement Network

The layout and design of the building were created to help to ease issues caused by dementia and partially counter them. Among the main aspects of the building is the connection to external spaces and daylight, which includes easy access to a variety of external spaces and a secure garden area.

Another important aspect of the design was the prevention of dead ends and meaningless corridors to facilitate wayfinding where the user will have less chance to get lost or confused. The wayfinding is as clear and straightforward as possible. The freedom was a key aspect of the design. All residents should have access to all spaces – internally and externally (except for Back of House). Whilst on the Ground floor all bedrooms have their garden access, the upper floor residents have access to the roof garden off the central lounge. Also, to avoid the risk of isolation caused by anxiety and confusion, the design team decided to adapt the layout to provide several communal and semi-private spaces (Conrad & April 2018)

Figure 11 and 12: Abbeyfield Winnersh Interior



Image source: © Housing Learning & Improvement Network

Figure 13: Abbeyfield Winnersh Internal Circulation



Image source: © Housing Learning & Improvement Network

The Reminiscence Windows were placed as an integral part of the street scene and have a similar function as memory boxes which can also assist with wayfinding. However, in this case, even if the windows are left empty, it does not look out of place.

The front doors to each bedroom are a different color which is not linked to the color code of the streets to avoid confusion. The doors have fully functioning letter boxes, streetlights, and the Reminiscence Windows next to them. Abbeyfield's signage specialists in cooperation with the dementia team have developed their own subtle but visible signage throughout the home. Besides the door color, the bedroom signage includes room signs that not only have names but photos of the actual room itself, so that, when opening a door, the resident sees exactly what is depicted on the room sign.

CARPE DIEM DEMENTIA VILLAGE (2020)

Carpe Diem Village is an exceptional community that encourages seniors to age in a comfortable environment with opportunities for socializing and improving their overall health. The Nordic Office of Architecture in Dønski, Norway, developed this project, which comprises of two care levels. The first level has 136 communal housing units, and the second level includes 22 high-care dementia units. The communal housing units are intended for seniors who can live on their own, while the high-care units offer specialized care for seniors with dementia who require greater assistance.

Figure 14: Carpe Diem Dementia Village



Image source: Nordic architecture official website⁶

⁶Available at <https://nordicarch.com/project/donski-dementia-village>. Accessed 15th of December 2022.

The architect aimed to create a building that resembled a familiar home rather than an impersonal institution. To achieve this, the design focuses on producing a welcoming and comfortable environment. The communal housing units are designed to have an apartment-like feel, with each unit having a living room, bedroom, kitchen, and bathroom. They are arranged around a central courtyard that offers residents a communal area for socializing and enjoying outdoor activities.

The cozy atmosphere is further enhanced with gardens and squares. The buildings, which are two or three stories tall, are subdivided into smaller units, providing a charming village atmosphere. The varying building heights and roof design typology contribute to the friendly neighborhood feeling.

Figure 15: Carpe Diem Dementia - Everything you need inside the village

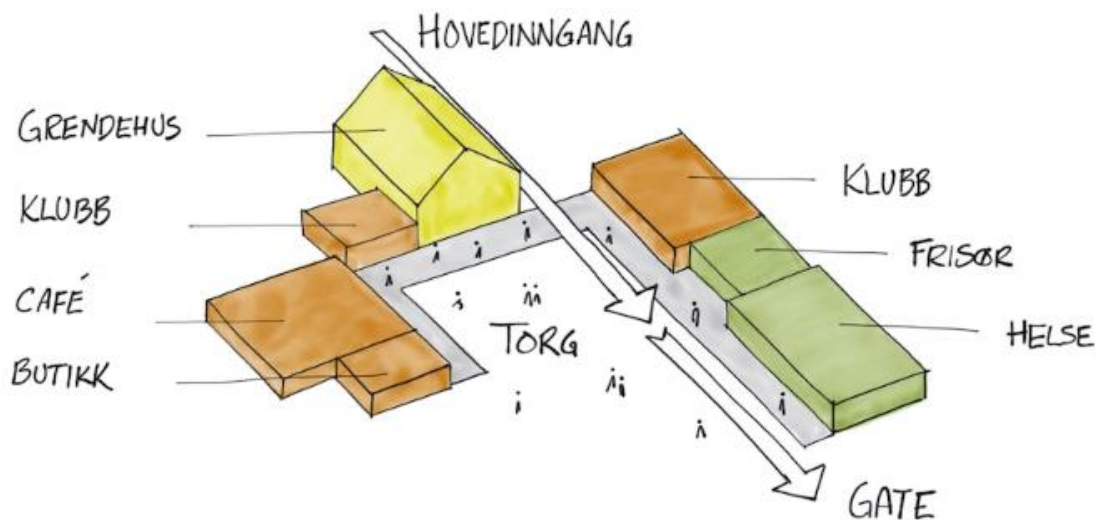


Image source: Nordic architecture official website

Figure 16: Carpe Diem Dementia - Walking routes within the village

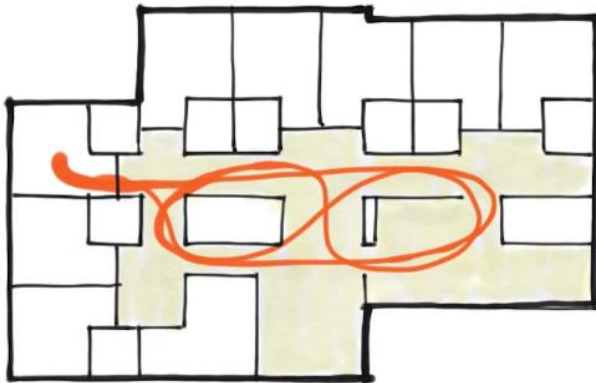


Image source: Nordic architecture official websi

The high-care dementia units prioritize safety above all else. Positioned on the first floor, they are safeguarded with a keyless entry system. Each unit is designed to house one or two residents and comes with a private bedroom, bathroom, and living area. Additionally, the units are equipped with a sensor system that tracks the residents' movements and notifies the staff if they need assistance.

Apart from this, Carpe Diem Village boasts various shared areas, such as a restaurant, library, fitness center, and spa. These spaces are intended to promote socialization and provide residents with a diverse range of activities to engage in.

Due to the fact that individuals with dementia often struggle with recognizing their surroundings and navigating, it was imperative for the architects that the outdoor areas were clearly identifiable spaces. The architecture firm implemented various markers and recognizable elements throughout these areas to facilitate wayfinding for the residents.

Moreover, inclusive design principles were employed in developing all indoor and outdoor spaces, as well as pathways and entrances.

The Nordic Office of Architecture prioritized sustainability in their design of Carpe Diem Village. The complex was constructed using eco-friendly materials and incorporates energy-efficient technologies like solar panels and a ground-source heat pump. Furthermore, the complex has a green roof that offers insulation and reduces the heat island effect.

Overall, the Carpe Diem Village is a distinct community that provides seniors with diverse housing options and specialized care services. The community encourages social interaction, general well-being, and aging in place. Through its emphasis on sustainability and innovative design, Carpe Diem Village is a model for senior living communities across the globe.

Figure 16 and 17: Carpe Diem Dementia Village



Image source: Nordic architecture official website | photo: Benjamin A. Ward

DEMENTIA AND THE BUILT ENVIRONMENT

“Loss of memory, poor learning, difficulties with language, in recognising objects and in planning and organising, appear to be the main symptoms of dementia. How can environmental intervention assist people with dementia?” (Halsall & MacDonald, 2015)

For people living with dementia, the symptoms they experience can have a significant impact on their confidence and ability to continue to lead an independent and fulfilled life (Evans et al., 2019). When designing or adapting spaces for people with dementia, it is important to understand the symptoms generated by the disease and how it affects the person and their interaction with the physical environment. It is essential to be aware of the limitations of the main occupant to create and/or adapt environments that support the needs, well-being, and quality of life of those living with dementia. Through careful design solutions, designers would be able to reduce some of the issues of the disease, supporting people suffering from dementia to be more independent and to feel comfortable in the environment in which they live.

Age-related issues and impairment can cause a range of symptoms, in consonance with the literature review findings, among the most common symptoms of dementia that can affect their relationship with the surrounding physical environment are: Spatial disorientation (Liu, Gauthier & Gauthier, 1991; Marquardt, 2011; Wiener & Pazzaglia, 2021), memory loss (Torrington, 2006; Digby and Bloomer, 2014; Godwin, 2014; van Hoof et al., 2015; Hung et al., 2017) and behavioral disturbances (van Hoof et al., 2015; Hung et al., 2017). Visual impairment is also among the most common symptoms, although it is also caused by ageing.

According to the World Health Organization (2012), these symptoms can be shown even in the early stages of the disease.

To address these challenges, there is a growing body of research on how design architecture can be adapted to support people with dementia. This study relies on the existing research and evidence base carried out by several universities, researchers and other networks. According to the literature findings, aspects of the design were summarized in *Tables 2 and 3*, for the pre-design stage and post-design/adaptation stage of an architectural project, respectively. Whether adapting a residence or designing a purpose-built elderly care home for people with dementia, these aspects should be taken into consideration.

As mentioned in Chapter 2, the method adopted by Bardin (1977) of Analsys Content resulted into the following categories: **Design principles** and **design aspects** of designing for dementia. Design principles are concepts that guide the design process. On the other hand, design aspects are the specific elements of a design that should be adopted when creating a particular design.

Table 2. Pre-design aspects for Designing for Dementia

DESIGN ASPECT	SPECIFICITY	REASON	SOLUTION
LIGHTENING	NATURAL LIGHT	Circadian rhythm	Analysis of the relationship with outside, windows views, balconies, indirect light
		Visual Impairments	Analysis of natural lightening
LAYOUT, TYPOLOGY	OUTDOOR SPACES	Avoid behavioral disturbances	Well defined paths, resting and contemplating areas
		Keep active engagement	Free flowing, garden placement
		Social engagement	Placement of social areas
	CIRCULATION	Autonomy, spatial orientation	Well planned layout, paths circulation, direct visual access to bathrooms
	HUMAN SCALE	Sense of identity	Small scale (less institutional)
	SAFETY	Safety and privacy	Allow people to see and to be seen
ACCESSIBILITY	Support movement, autonomy	Application of universal design	

Table 3. Post-design/adaptation aspects for Designing for Dementia

DESIGN ASPECT	SPECIFICITY	REASON	SOLUTION
COLORS AND CONTRAST	USE OF COLORS	Aboid behavioral disturbances	Analysis of the psychology effect of colors on the walls
		Memory assistance	Individual doors with distinct colors
	USE OF CONTRAST	Visual impairments, spatial orientation, memory assistance, safety, autonomy	Contrast color on key features (switches, sockets, handrails), furniture, handles, step edges, sharp Edges
LIGHTENING	ARTIFICIAL LIGHT	Visual impairments, safety	Indirect light: highlight tripping harzards, good overall internal illumination, direct lights for specific tasks (cooking, reading, etc)
	AUTOMATION	Visual impairments, safety	Movement sensor for lights
WAYFINDING	CIRCULATION	Orientation, Memory loss	Signage easy to read, large visuals
ELEMENTS	FURNITURES AND OBJECTS	Visual impairments	Reduce Tripping Hazards
		Sense of identity, sense of belonging, memory loss	Familiar Spaces, Decoration

FINISHES AND MATERIALS	WALLS AND FLOORS	Visual impairments, avoid behavioral disturbances	Avoid confusing patterns, avoid glare and shiny finishes
	OBJECTS	Avoid behavioral disturbances	No uncovered mirrors
	DOORS	Visual Impairments	Avoid translucent doors, place signage when unavoidable

DEMENTIA SYMPTOMS THAT CAN IMPACT HOW INDIVIDUALS RELATE TO THE ENVIRONMENT



MEMORY LOSS

Memory loss is a common symptom of dementia that can vary in severity depending on the type and stage of the disease (Alzheimer Europe, 2019; World Health Organization, 2012). Typically, individuals with dementia experience memory problems that affect their ability to recall recent events, conversations, and tasks. They may also struggle with retaining new information or learning new skills (Alzheimer’s Disease International, 2018). Nevertheless, it’s important to note that memory loss is not the only symptom of dementia and may not be present in all cases.

In some cases, memory loss may not be noticeable in the early stages of dementia, but as the disease progresses, it may become more pronounced. For example, individuals with Alzheimer’s disease, the most common form of dementia, may initially experience mild forgetfulness, such as misplacing objects or forgetting names. As the disease progresses, they may forget important events, have difficulty with language and communication, experience changes in mood and behavior and, accordingly the World Health Organization (2012) being increasingly difficult to recall

time-spatial information in which the patient get lost even in familiar spaces and to lose track of time.

Research has shown that spatial disorientation and difficulty with wayfinding are among the early symptoms of dementia (Marquardt, 2011). For example, individuals with dementia may have trouble remembering where they are in a building, finding their way around a room, or following directions to a particular location. This can have significant implications for their safety and well-being, as well as their ability to perform daily activities independently.

In fact, studies have proven that wandering and getting lost are common behaviors among individuals with dementia (Algase et al., 2002). These behaviors can be especially dangerous, as individuals may become disoriented and unable to find their way back to safety. This can increase the risk of accidents, falls, and other injuries.



SPATIAL DISORIENTATION

As people age, their navigation abilities can decline, and this can be even more pronounced in those with dementia. As mentioned in the previous topic, people with dementia often experience difficulty navigating through new or unfamiliar environments due to a decline in spatial orientation and wayfinding abilities (Liu, Gauthier & Gauthier, 1991; (Wiener & Pazzaglia, 2021). This can have a significant impact on their ability to perform daily activities independently and can ultimately lead to institutionalization (Marquardt, 2011).

For this reason, movement and orientation becomes a challenge to be addressed in the building design for dementia.



BEHAVIOR DISTURBANCES

The behavioral and psychological symptoms linked to dementia profoundly affect the quality of life of people with dementia and their caregivers (World Health

Organization, 2012). It is a common symptom to become less active and motivated, as well as showing mood changes, including depression or anxiety, in some cases, the patient may react unusually angrily or aggressively. As the syndrome progresses, it may include inappropriate behavior such as disinhibition or aggression (World Health Organization, 2012). Also, in the cases where people with dementia struggle to make sense of their environment, can result in high levels of stress. They also have a lower threshold for stress, so may become very agitated when they are overstimulated by noise, excessive activity or movement (Halsall & MacDonald, 2015).

Due to their condition, it is important to dedicate time to building and fostering a relationship based on trust, warmth, and empathy (Nygård, 2006; Hellstrom et al., 2007). In general, it is particularly interesting to involve a person with dementia in activities that encourage curiosity and engagement. According to van Hoof et al. (2015), being stimulated to participate in activities may, in turn, lead to positive behavioral outcomes.







VISUAL IMPAIRMENT

Visual impairment is a common condition among older adults, and it is even more prevalent in people with dementia. It naturally occurs due to the thickening of the lens with age, in this way, the color perception of elderly people is affected. Aged vision may experience colors as 'washed out' and may increasingly find blues, greens and purples harder to differentiate (Greasley-adams et al., 2014).

These impairments can cause significant challenges in daily living, such as difficulty recognizing faces, reading, navigating unfamiliar environments, and even completing self-care tasks such as dressing and grooming. Visual impairment can also contribute to the behavioral and psychological symptoms of dementia.

ENVIRONMENT DESIGN PRINCIPLES GUIDE FOR DEMENTIA

Table 4. Main Symptoms and Design Principles for Dementia

				
FAMILIARITY	✓		✓	
SAFETY AND PRIVACY	✓		✓	✓
ACCESSIBILITY			✓	✓
SPATIAL ORIENTATION		✓	✓	
TIME ORIENTATION	✓		✓	✓

FAMILIARITY

Spaces should be designed to be familiar and promote the feeling of belonging. People feel more at home when they have familiar objects around them (Mitchell et al., 2003). In care home settings it is important that residents are able to personalize the furnishings in their rooms (Greasley-adams et al., 2014). This is enhanced in the case of people living with dementia, mainly because they relate to their environment through familiar places, objects, or landmarks. Familiar faces of family, friends and neighbors become very important. Memory of past times and events may be more easily recalled than recent events (Halsall & MacDonald, 2015). Memory can be aided

through considerations of familiarity. Remembered styles and scenes may assist in reducing disorientation for end users.

The creative session realized with people living with dementia in the van Hoof et al. (2015) study, identified that the use of familiar pieces of furniture as well as preferred color schemes and patterns are aesthetically pleasing aspects of the built environment, contributing to a sense of familiarity and recognition, and, in turn, to a sense of home.

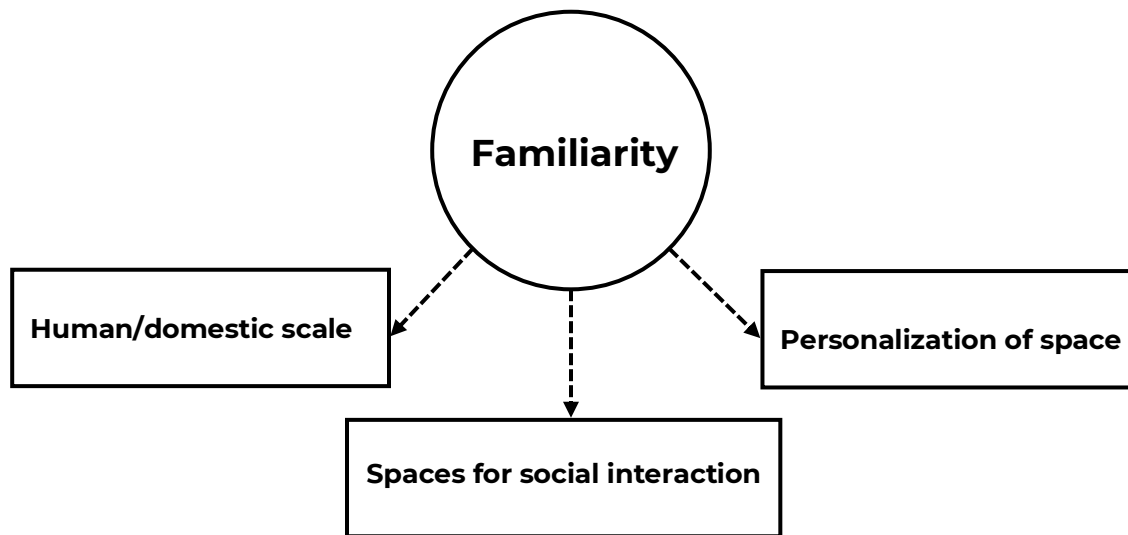
The less institutional an environment appears, the better, this concept comes from the humanization of healthcare which emphasizes the ethical values of respect and solidarity to the human being (Howard & Strauss, 1975). Another similar approach is patient-centered care that emphasizes the individual needs and preferences of each person. This approach recognizes that people with dementia are unique individuals with their own life history, values, and interests. Designing environments that are person-centered involves considering the individual needs of each person and creating spaces that reflect their unique preferences and needs. Ideally, a person-centered environment for someone with dementia is safe, has access to outdoor and indoor spaces, enhances social interaction, and provides easy ways for a person to find their way around the environment (Halsall & MacDonald, 2015).

Avoiding an institutional feeling is difficult and applying a domestic/human scale is important in achieving this. In a review of the impact of the design of the built environments on people with dementia, Marquardt et al. (2014) concluded that small-scale environments (Fleming & Purandare, 2010), an environmental aspect strictly related to spatial navigation are associated with the reduction in dysfunctional behavior and improved well-being including less depressive symptoms and improved mood and quality of life.

Single store dwellings are preferred while designing for dementia (see the 'Abbeyfield Winnerish' Project in Chapter 3). However, this might not always be possible, in more than one single store schemes there should be obvious staircases and lifts in prominently visible positions (Halsall & MacDonald, 2015).

Promoting social interaction is another important approach of humanization for people with dementia. Spaces should be designed to promote opportunities for socialization, with features such as communal areas, comfortable seating, and accessible outdoor spaces.

Diagram 2. Familiarity principle and its key approaches in the design



SAFETY AND PRIVACY

Among the results of Hung et al. (2017), people with dementia need to be in places where they feel emotionally safe since some symptoms of the disease can lead to feelings of insecurity. However, it is necessary to balance the safeness and privacy of individuals.

In the case of dementia, it is important to be careful with patient surveillance, in which, depending on the stage of dementia, the person needs to be monitored by medical professionals without having their privacy compromised. The apparently visual privacy between the healthcare team and the patient can be attributed through the spatial configuration of the physical environment.

Design should be based on a clear hierarchy of spaces between public and private areas. Connections with the outside, views to green space and access to

patio, terraces or balcony should be considered from the point of view of people who may be confined to bed, so windows levels should be low (Halsall & MacDonald, 2015).

Within the constraints of privacy, designs should be preferably open plan but avoid directly facing bedroom doors or apartment entrances. Glazed screens can be useful in some situations, to assist orientation, but the screens must be easily identifiable, so as not to be confused with doorways and openings. Also, it is important to mention that the glazing can cause reflections which can be disorientating (Halsall & MacDonald, 2015). Reflection can be an issue for visual impairments, but also for another reason that will be discussed further in the design aspects topic.

Designing for privacy involves creating spaces that are comfortable and safe for people with dementia, while also respecting their need for personal space and independence. Some key considerations for privacy in design for dementia, include:

- Personal space: People with dementia may benefit from having their own personal space, such as a private bedroom or seating area. This space should be designed to be comfortable, with familiar furnishings and decorations.
- Acoustics: Noise levels can be a significant source of anxiety for people with dementia. Design features such as sound-absorbing materials or double-glazed windows can help reduce noise levels and create a more peaceful environment.
- Visual privacy: Visual privacy can be important for people with dementia, particularly in spaces like shared bedrooms. Design features such as curtains or dividers can help create a sense of privacy and prevent residents from feeling exposed.
- Safety features: Safety is a key concern in design for dementia, particularly in spaces where residents may be at risk of injury, such as bathrooms or kitchens. Design features such as grab bars, non-slip flooring, and temperature controls can help prevent accidents and create a safer environment.

- Dignity: Maintaining residents' dignity is an important aspect of privacy in dementia-friendly design. This can include features such as private bathrooms and discreet clothing change space.

ACCESSIBILITY

Accessibility can be seen as the degree to which an environment is usable by people with disabilities. Accessibility can be achieved through various design elements and features. Since spaces are for everyone, it is recommended to adopt universal design guidelines while designing for the public in general. Universal design principles are based on the idea that everyone benefits from inclusive design, not just people with disabilities.

Universal design is essential in creating an inclusive society. It removes barriers and promotes equality and independence for people with disabilities. A building designed with universal design principles is usable by people with diverse abilities and characteristics, without the need for adaptation or specialized design. The aim is to create environments that are accessible to all people, regardless of their age, size, abilities, or disabilities. This includes certain features like wide doorways, accessible entrances, and ramps, making it easy for people with mobility challenges to move around independently (Grey et al., 2018).

Accessibility is an important consideration for people with dementia, as they may experience difficulties with memory, vision, communication, and spatial awareness. Creating an accessible environment for people with dementia can help to reduce their stress and anxiety, promote their independence, and enhance their quality of life.

The design of all environments must respond to the needs of a full range of users including those living with dementia. According to the guide written by Greasley-adams et al. (2014) and the one by Halsall & MacDonald (2015), regarding accessibility, designers can respond by considering the following aspects:

- Circulation: Needs to be wide enough for wheelchairs, mobility scooters and pedestrians to pass each other with ease and safety. Continuous routes containing a surface with materials chosen to aid orientation and sense of

direction. Additionally, external entrances and exits should be designed to provide easy access to outdoor spaces.

- **Materials:** Carefully selected to avoid reflective or dark surfaces which could confuse perception. Patterns in flooring or paving should be used with care to avoid perceptual difficulties. Avoid arbitrary patterns which could confuse and disturb.
- **Avoid steps:** People living with dementia may have difficulty judging distance. Steps or escalators, if necessary, should have clearly visible alternatives - lifts or ramps at an acceptable gradient.
- **Reduce clutter and obstructions:** Particularly in footways which should be dedicated for use by pedestrians, mobility scooters and wheelchairs.

SPATIAL ORIENTATION

Spatial orientation refers to an individual's ability to understand and navigate their physical surroundings. It involves several cognitive processes, such as perception, attention, memory, and problem-solving. As mentioned previously, people with dementia, particularly those with Alzheimer's disease, often have trouble with spatial orientation, which can negatively impact their quality of life (van Buuren & Mohammadi, 2021).

According to Wiener & Pazzaglia (2021) spatial orientation is crucial for people with dementia for several reasons. Firstly, it enables them to maintain their independence and safety by helping them navigate their surroundings and avoid accidents, such as falls or getting lost. Secondly, it can improve their social interactions and engagement with their environment, as it allows them to participate in activities and communicate with others effectively. Thirdly, spatial orientation can enhance their overall well-being by promoting feelings of control, confidence, and familiarity.

The effects of impaired spatial orientation in people with dementia can be significant. They may experience confusion, disorientation, and anxiety, which can lead to depression and social isolation. They may also become more dependent on caregivers and require more supervision, which can affect their sense of autonomy

and dignity. In some cases, impaired spatial orientation can even lead to wandering, a common and dangerous behavior among people with dementia.

TIME ORIENTATION

Impacted by memory loss, people with dementia also often experience changes in their perception of time (Iwamoto & Hoshiyama, 2012; Marquardt, 2011), they might struggle to remember the current day, month, year, and time of day. As the disease progresses, they may have difficulty understanding the passage of time and lose the ability to remember events from the past or anticipate future events. This can be distressing for the individual with dementia.

The guidance regarding time for human beings is very important for regulation of the circadian cycle. The circadian cycle or rhythm is regulated by exposure to natural lighting, influences the body's sleep-wake cycle, hormone production, and other biological processes. As such, proper exposure to natural lighting is important for maintaining overall health and well-being (Day et al., 2000; Grey et al., 2018). The amount of light that people receive through natural lighting has an impact on everyone, including those with dementia.

ENVIRONMENT DESIGN ASPECTS GUIDE FOR DEMENTIA

Table 5. Design Principles and aspects for Dementia

DESIGN PRINCIPLE	FAMILIARITY	SAFETY AND PRIVACY	ACCESSIBILITY	SPATIAL ORIENTATION	TIME ORIENTATION
DESIGN ASPECT	ELEMENTS	ELEMENTS	ELEMENTS	COLORS AND CONTRAST	COLORS AND CONTRAST
	COLORS AND CONTRAST	COLORS AND CONTRAST	COLORS AND CONTRAST	WAYFINDING	LIGHTENING
	LIGHTENING	LIGHTENING	LIGHTENING	T TYPOLOGY, LAYOUT	
	T TYPOLOGY, LAYOUT	FINISHES AND MATERIALS	WAYFINDING		
		T TYPOLOGY, LAYOUT	T TYPOLOGY, LAYOUT		

COLORS AND CONTRAST

Color and contrast can both be used to enable people with sight loss and dementia to identify different rooms and key features inside and outside of their homes. Good use of color and contrast can facilitate independent living, for example, by supporting people to find their way around and to use fixtures and facilities such as lighting unassisted (Greasley-adams et al., 2014).

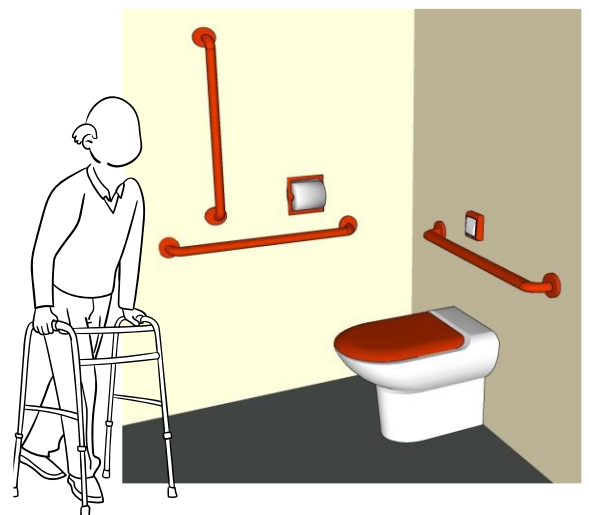
People with dementia have diminished ability to see contrast, therefore a good tonal contrast is needed between walls and floors. Ability to perceive color may be reduced, so choice of color finishes or signage is critical (Halsall & MacDonald, 2015). Color contrast is therefore key to providing visual clues for key features (Greasley-adams et al., 2014) such as doors, handles, controls and furniture, thereby enabling occupants with poor sight to better make sense of their surroundings.

The use of subtle traditional patterns can be helpful in keeping the interior familiar to the occupants, however, it is important to avoid striped or swirling strobing patterns which could cause distress and agitation (Halsall & MacDonald, 2015).

Here are some ways to use colors and contrast effectively in design for people with dementia:

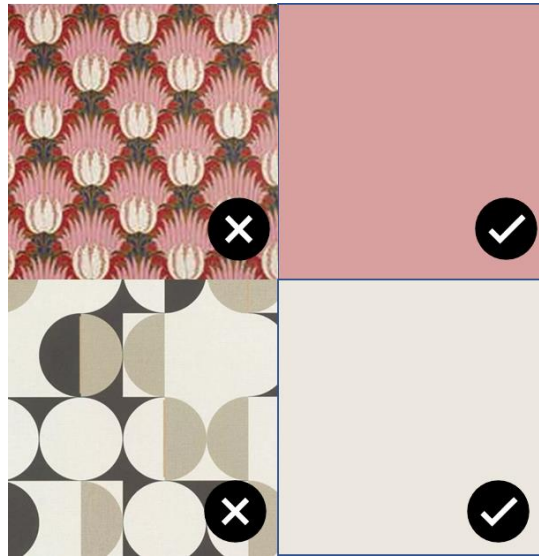
- Use of High Contrast: People with dementia may have difficulty differentiating between similar colors or shades, which can make it harder for them to distinguish objects or information. Therefore, it is essential to use high-contrast colors in design to make information and objects stand out. For example, using contrast color to aid memory in daily necessities, such as the use of the WC (figure 18).

Figure 18: High contrast handrails



- **Avoid Complex Patterns:** Complex patterns or designs can be confusing and overwhelming for people with dementia. It is best to use simple, solid colors or subtle patterns in design elements such as wallpaper or flooring (figure 19).

Figure 19: Avoid Complex Patterns



- **Consider Color Combinations:** Some color combinations can be challenging for people with dementia to differentiate, such as red and green. It is important to consider color combinations when designing for individuals with dementia and use color combinations that are easy to differentiate. Some colors may also avoid behavioral disturbance, and the use of calming colors like blue, green, or earth tones to create a soothing atmosphere is recommended.
- **Use Color to Create Visual Cues:** Color can be used to create visual cues and help individuals with dementia navigate their environment. For example, using a different color in different bedroom doors as a memory aid.

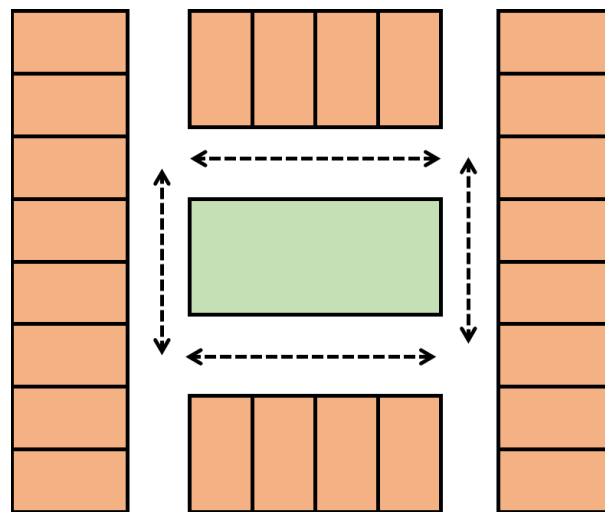
TPOLOGY, LAYOUT

A person with impaired memory and reasoning will rely very heavily on what they can see. Creating a clear layout with lots of visual cues is important. Open plan

layouts carefully planned so that residents can see the toilet from key positions in the house or apartment work well (Halsall & MacDonald, 2015). The design layout of a project for aged people with dementia should avoid some aspects such as complexity, path choices, dead-end and long corridors, meaningful spaces, and restriction of movement.

The nursing home constructed in the shape of a continuous path around an inside courtyard (figure 20) was widely recommended by architects as it was deemed to be safe for wandering and to enhance orientation (see 'Five Gardens' and 'Abbeyfield Winnerish' case studies in Chapter 3).

Figure 20: Circulation with center courtyard



Corridors, if unavoidable, should be short and wide enough to function as social spaces, possibly with informal meeting areas, seating and views to the garden. Natural light should be maximized (Halsall & MacDonald, 2015).

In summary, features that should be considered are, as it follows:

- Consistent organization of facilities and amenities throughout space.
- Minimization of clutter and unnecessary items in circulation.
- Open plan layouts with clear visibility of important areas, such as toilets.
- Consideration of a continuous path design for nursing homes to enhance orientation and safety.

- Short and wide corridors with informal meeting areas and views of the garden to function as social spaces.
- Avoidance of complex layouts and long dead-end corridors.
- Avoidance of meaningful spaces and restriction of movement.

WAYFINDING

Wayfinding is a coordinated and goal-directed movement through the environment, and it is defined as the process of determining and navigating a route from an origin to a destination. Good wayfinding abilities (derived from the interaction between individual and environmental factors) are an important source of quality of life and autonomy. Emotions became still more relevant in atypical ageing when people with dementia interact with non-familiar environments (Wiener & Pazzaglia, 2021).

The signage throughout the environment should be well-placed and not overbearing. There is a risk of an overbearing institutional feel by placing too much signage (or too large signage) in corridors, day spaces etc. The opposite of that is not enough signage or too small signs.

Figure 21: Wayfinding signage



Designing for effective wayfinding involves creating an environment that is easily navigable and helps people with dementia feel confident and safe in their

surroundings. Some key considerations for effective wayfinding in dementia-friendly design include:

- Clear signage: Signage that is easy to read, uses simple language, and includes clear symbols (figure 22) can help people with dementia navigate their environment. Signage should be placed in consistent locations throughout the environment, such as at entrances and exits, at key intersections, and near important amenities.

Figure 22: Clear signage



- Color and contrast: Using contrasting colors and patterns can help people with dementia distinguish different areas and objects. For example, contrasting the color of a door with the surrounding wall can help residents easily identify the entrance to a room.
- Consistent layout: Using a consistent layout throughout a building or space can help people with dementia feel more comfortable and confident in their surroundings. Placing important facilities like restrooms, kitchens, and bedrooms in the same location on each floor can help residents easily find what they need.
- Lighting: Good lighting is essential for wayfinding. Movement sensor lights to show the way are an interesting option.
- Spatial organization: The layout of the space should be organized to support wayfinding. This can include using landmarks, like pictures or other visual cues, to help people with dementia identify different areas. Creating areas with clear

purposes, like a dining room or activity area, can also help residents better understand their environment.

By incorporating these features into wayfinding design the quality of life for people with dementia is improved and their surroundings become more comfortable and manageable. Effective wayfinding provides more autonomy while also improving their safety.

ELEMENTS (OBJECTS, FURNITURE, FIXTURES AND FITTINGS)

People with dementia can mislay things easily. Objects, furniture, fixtures, and fittings are important aspects of the environment and offer a great help in the quality of life of occupants and in some cases can also be disturbing. The placement of those elements needs to be taken into consideration.

At some point in the progress of the disease, people with dementia might feel disturbed and confused by their own reflections. For this reason, turning the mirror around to show a picture on the reverse or the possibility of hiding the mirror with a curtain, can help reduce agitation (Fleming, Richard; Zeisel, John; Bennett, 2020; Grey et al., 2018; E. I. J. Van Hoof & Kort, 2009).

A good visibility of kitchen shelves, for example, can be a great support, as well as glazed panels to drawers and cupboards with clear labelling indicating their contents (Halsall & MacDonald, 2015). This method described above can be adopted in several spaces, especially the ones in which the user might need to use more often for daily duties, e.g. Sanitaryware should be recognisable and visible, contrasting against floor and wall finishes; tableware may be 'of an era' to be more easily recognised and useable (Halsall & MacDonald, 2015).

Tripping hazards should be avoided, for elderly people in general and also for the ones with dementia. Rugs and mats are a great example of potential tripping hazards and removing them can contribute to greater safety in the environment (Greasley-adams et al., 2014).

Elements to aid the memory are always welcome, some of which are cited in Fleming, Richard; Zeisel, John; Bennett (2020), Grey et al. (2018) and E. I. J. Van Hoof & Kort (2009):

- Calendars: A large, clear calendar that prominently displays the day, month, and year can help people with dementia understand the passage of time.
- Clocks: A large, easy-to-read clock can help people with dementia keep track of the time of day. You could also use clocks that have both the time and the day of the week displayed on them.
- Reminders: Simple, visual reminders can help people with dementia remember what day it is and what they need to do.
- Accessories: The use of visual cues like signage, labels or memory boxes can help individuals with dementia remember where they are and what they are doing. Physical aids:

Elements to physically aid should also be adopted, such as:

- Handrails and grab rails: can be helpful throughout the home but are particularly important near external and internal stairs and in bathrooms or toilets. Where these are positioned at stairs, they should extend beyond the first and last steps before coming to a clearly defined end.
- Tactile markers: Some people with sight loss and dementia may find tactile markers useful as a way to navigate round their homes, e.g., plastic bumps stuck to the underside of handrails to signal key points such as the proximity of doors on the opposite side.
- Automated lights with motion sensor: Specially to highlight tripping hazards.
- Thoughtful Furniture: Furniture with rounded edges and corners is preferred over sharp edges or corners that could cause injury in case of a fall. Comfortable and supportive chairs and sofas with armrests and high backs are important to maintain good posture and prevent fatigue. Furniture should be arranged in a way that is easy to navigate, with clear paths between furniture pieces.

In general, these principles are interesting while choosing elements for the physical environment:

- **Sensory stimulation:** Incorporating sensory-rich elements such as textured fabrics, bright colors, and natural materials can be helpful for people with dementia. These elements can help create a familiar and engaging environment that promotes sensory stimulation.
- **Familiarity:** Designing with familiar objects and furnishings can help people with dementia feel more comfortable and at ease in their surroundings. Using familiar items like clocks, radios, and photographs can help create a sense of familiarity and promote a feeling of home.
- **Safety:** Safety is a critical concern in dementia-friendly design. Objects should be designed to be stable and secure, with no sharp edges or corners that could cause injury. Objects should also be arranged to create clear pathways and promote easy movement.
- **Independence:** Promoting independence is an essential aspect of dementia-friendly design. Objects should be arranged to be easily accessible, and furniture should be designed to be comfortable and supportive.
- **Functionality:** Designing for functionality is also important in dementia-friendly environments. Objects should be arranged to be easy to use and understand. For example, labels and signs can be used to help residents navigate their surroundings, and furniture should be arranged to promote easy movement and accessibility.

LIGHTENING

Lighting is important to people with sight loss and dementia. Good lighting can make the most of people's capabilities and help to compensate for poor eyesight; it can assist people in finding their way around both new and familiar spaces and help them to undertake specific tasks (Greasley-adams et al., 2014).

Lighting is an important factor in creating a comfortable and safe environment for people with dementia. Designing spaces with proper lighting can help to

enhance their wellbeing, reduce agitation and improve sleep patterns. Here are some ways that design can help with lighting for people with dementia:

- **Natural light:** Natural light is beneficial for people with dementia as it helps to regulate the body's circadian rhythm, which is important for regulating sleep patterns. Caregivers can design spaces to maximize natural light by positioning furniture and windows in a way that allows the most amount of sunlight into the room.
- **Artificial light:** Artificial light can be used to supplement natural light in areas that don't receive enough natural light. It is important to use lighting that is not too bright or too dim, as this can cause confusion and disorientation. Caregivers can use light fixtures with dimmer switches to adjust the light levels and create a more comfortable environment.
- **Task lighting:** Task lighting/direct lighting can be used to help people with dementia perform specific tasks, such as reading or writing. By providing targeted lighting in areas where they need it, they can remain more independent and comfortable in their daily activities.

FINISHES AND MATERIALS

When designing for people with dementia, there are several finishes and types of materials that can be used to create a supportive and safe environment. According to Halsall & MacDonald (2015) the finishes and types of materials used in designing for people with dementia should prioritize safety, comfort, and familiarity.

According to the findings, some options are summarized as it follows:

- **Flooring:** Slip-resistant, low-gloss, and non-glare flooring materials are ideal for reducing the risk of falls. Smooth flooring materials like vinyl, linoleum, or hardwood are easier to navigate and clean than carpeting, which can cause tripping hazards. Additionally, the use of color contrast between the flooring and walls can help individuals with dementia differentiate between different areas.
- **Walls:** Avoid using busy patterns (figure 19) on walls as these can be confusing and overwhelming for individuals with dementia. Painted walls are preferred over wallpaper because they are easier to clean and maintain.

VISUAL ADAPTATION DESIGN GUIDE FOR DEMENTIA

The findings of this investigation were synthesized into a comprehensive visual guide to demonstrate the recommended modifications for standard interior design spaces. This guide presents various analyzed aspects in a straightforward and descriptive manner, allowing even those without expertise in the field to comprehend the information. Essentially, it is a means of conveying information visually to facilitate understanding.

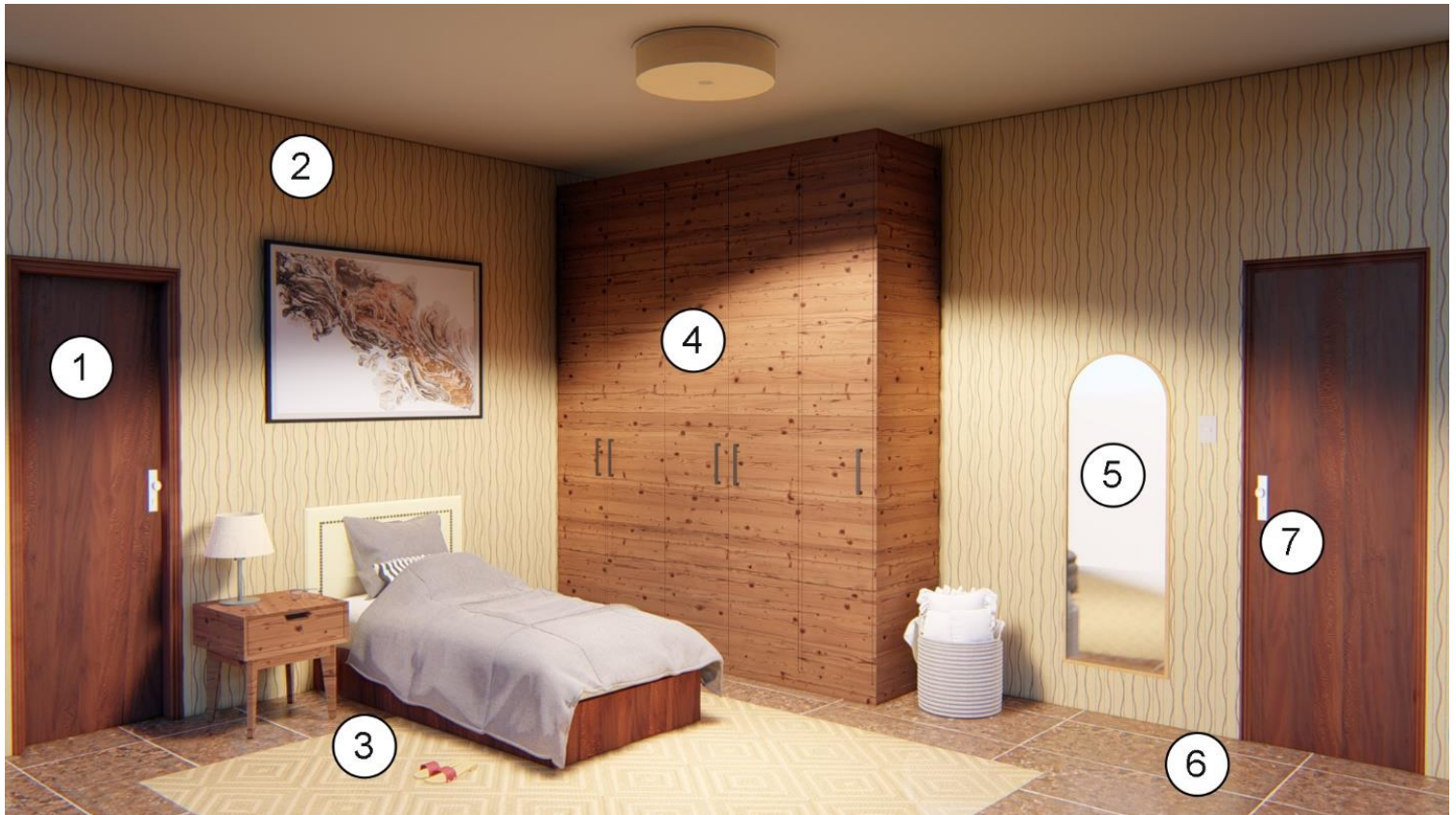
The visual guideline was subsequently made available on a digital platform (accessed by the QR code above), with the aim of ensuring accessibility to all individuals and professionals within the realm of design and architecture who may seek to expand their understanding of the subject matter. It is important to note that this website is open to the public and can be accessed by anyone seeking relevant information.

It is important to notice that the findings of this study are not strict rules but rather guidelines in order to provide scientific information regarding design for dementia. By incorporating these principles and aspects into architectural spaces, it is possible to create environments that are not only visually appealing but also containing further specific benefits.



<https://bit.ly/3VsZ2hi>

Figure 23. STANDARD BEDROOM ENVIRONMENT



1. Door without signage
2. Confusing patterns
3. Clutter and hazards, e.g.: rug, shoes, basket
4. Enclosed wardrobe without signage
5. Mirror can be an issue
6. Slippery and glossy tiles
7. No accessible handles

Figure 24. BEDROOM ENVIRONMENT ADAPTED FOR DEMENTIA



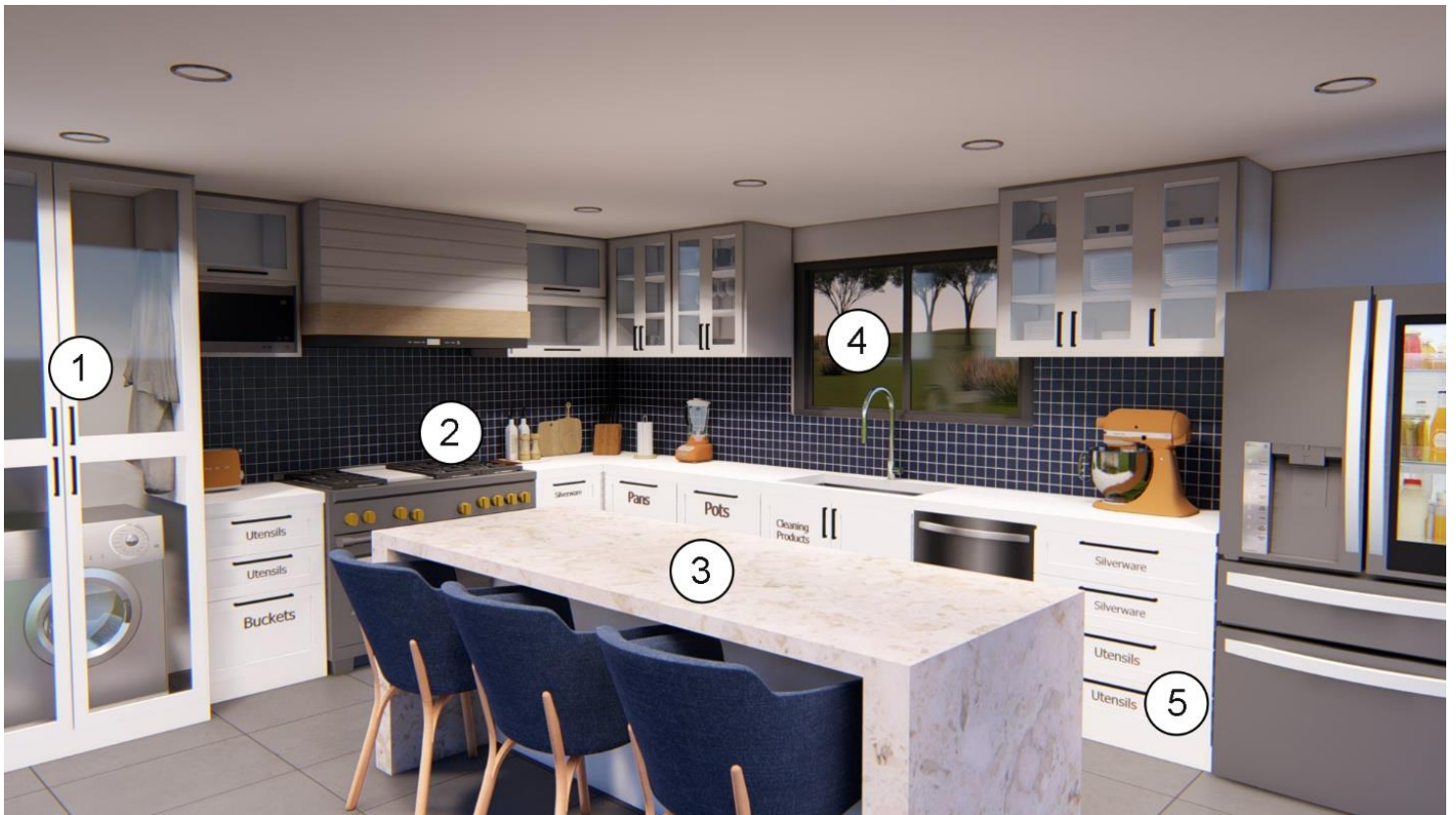
1. Open door to the toilet
2. Motion sensor indirect lights
3. Non-slip and non-glossy tiles – remotion of clutter and hazards
4. Dementia-friendly wardrobe
5. Dementia-friendly clock
6. Remotion or covering of mirrors
7. Humanization and personalization of the environment – home alike
8. Contrast colors between walls, floor, and furniture – including daily use fixtures such as the light switch box and the switch itself, handlers
9. Universal design handler – Personalized bedroom door

Figure 25. STANDARD KITCHEN ENVIRONMENT



1. Enclosed wardrobe without signage
2. Confusing patterns
3. Glossy finishing
4. Blurry window

Figure 26. KITCHEN ENVIRONMENT ADAPTED FOR DEMENTIA



1. See-through cabinets and open shelving – According to Greasley-adams et al. (2014) it may be better to avoid glass in favor of other, more shatterproof clear materials because using glass can present a safety risk.

2. Contrast between floor, walls, furniture, and objects

4. Relationship with exterior/vegetation

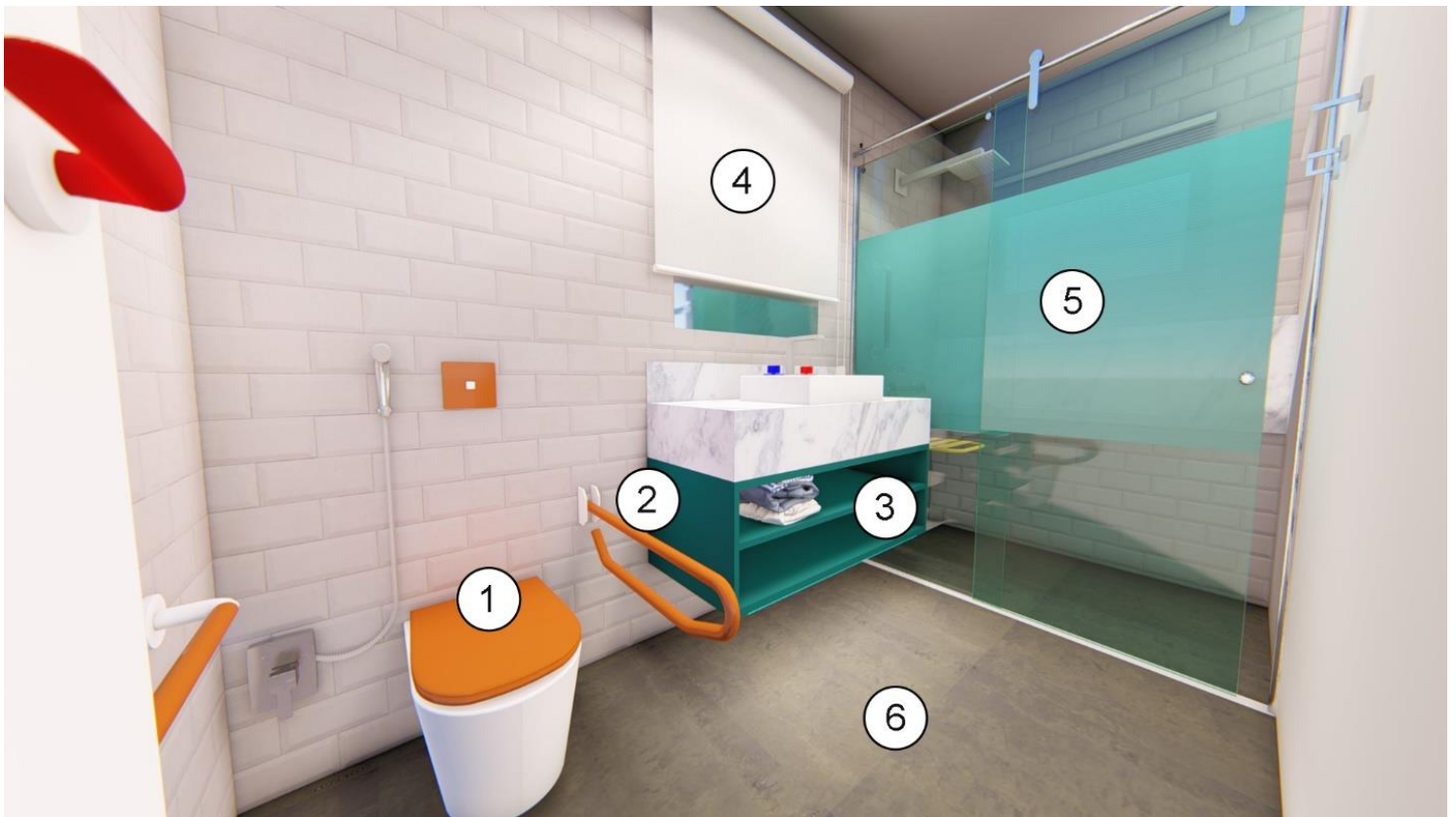
5. Signage - Labels with words/images

Figure 27. STANDARD BATHROOM ENVIRONMENT



1. Glossy finishing in every superfcies, especially slippery floor
2. Mirror can be an issue
3. Invisible shower screen

Figure 28. BATHROOM ENVIRONMENT ADAPTED FOR DEMENTIA



1. Contrast between floor, walls and furniture. Grab rails and daily use fixtures with a contrast between the wall
2. Accessibility - grab rails installation
3. Visible cabinets
4. Remove or cover mirrors
5. Visible shower screen
6. Non-slip and non-glossy tiles

Overall, this study achieved its objectives and was able to give a better understanding of the impact and relationship between the built environment and the elderly living with dementia. As it was presented in the introduction, the topic is extremely relevant nowadays when demographic change is a challenge for most countries in the world, accompanied by the growth of people affected by dementia. However, it is a relatively neglected field of study.

It became clear, based on scientific sources, that the physical environment can contribute towards enhancing the quality of life of individuals suffering from dementia. While dementia affects a person's cognition and interferes with the performance of activities of daily living, the design of the environment where they live can aid in their space-time orientation and support their personal identity as well as their autonomy and independence as long as possible.

Through the literature review and the case study analysis it was possible to identify design principles – taking into consideration the main symptoms of dementia – and design aspects as solutions for these issues. Six key design principles were developed, which are respectively: Familiarity, Safety and Privacy, Accessibility, Spatial-time Orientation. Deriving from these, physical design aspects were also developed and placed into pre-design and post-design aspects. The right pre-design and post-design choices can significantly reduce stress, confusion, and disturbance while simultaneously improving safety and reducing accidents. This approach applies whether the individuals are residing in care homes or their own homes.

The adoption of an interdisciplinary study was essential in order to bring together the current state of the art, which includes literature review from institutions from different countries, and case studies analysis. As mentioned, despite being a relevant topic, literature in the topic is still scarce. Nevertheless, it is

important to highlight that during the years in which this dissertation was conducted, new articles and information were often published.

It appears impossible to consider this study completed, as it is a complex field that still has many possibilities to be explored. It is suggested, as a continuation of the

work, the inclusion of people with dementia as active participants in the research. Although people with dementia have been perceived as incapable of being actively included, mainly because of verbal communication issues and memory loss, they have unique insights concerning their own condition and life and this should be explored.

ACADEMIA TO PROFESSIONAL WORK



Image source: Personal Archive

The integration between academia and profession has been crucial for the author during the doctorate journey. The author participated in several conferences, presenting, and publishing the results of her studies in most of them. During 1-2020/21 semester the author worked as a teaching assistant to guide international students of the Design Studio 1 class at the Faculty of Engineering and Information Technology at University of Pécs under the supervision of DLA Donát Rétfalvi. In two occasions the author presented her studies for a professional class group: during a master's degree class at Universidade Federal do Rio de Janeiro in Brazil and for a Social Network Association (Szociális Háló Egyesület) in Hungary. As an architect, the author worked on independent architectural and design projects and part-time

work at a multinational architecture software company in Budapest while pursuing her doctoral degree.

PUBLICATIONS

PUBLISHED FULL-PAPERS

1. "People with Dementia as Active Participants in Studies Related to the Built Environment: A Systematic Review". Authors: Fernanda Marx, Donát Rétfalvi. Journal of Aging and Environment, v. 35, pp. 77-87, 2021. DOI: 10.1080/26892618.2020.1793440
2. "Analysing the Hospital Room Through Social Representations". Authors: Fernanda Marx. Conference Proceedings 6th International Academic Conference on Places and Technologies 2019. pp. 429-436. Pécs, Hungary. ISBN: 978-963-429-401-6

PUBLISHED ABSTRACTS

3. "Virtual Visual Guideline of Spaces for People with Dementia". Authors: Fernanda Marx, Donát Rétfalvi. 18th Miklós Iványi International PhD & DLA Symposium 2022. Book of Abstracts, pp. 33. Pécs, Hungary. ISBN: 978-963-626-040-8
4. "Dementia-Friendly Residential Care Centre: Work in Progress". Authors: Fernanda Marx, Donát Rétfalvi. 17th Miklós Iványi International PhD & DLA Symposium, 2021. Pécs, Hungary. ISBN 978-963-429-811-3
5. "Academic Burnout at university: what it means". Authors: Diego Andrade, Ícaro Ribeiro, Fernanda Marx, Maté Orsolya. Interdisciplinary Doctoral Conference (IDK) 2021. Pécs, Hungary. ISBN 978-963-429-820-5
6. "Burnout Syndrome among health professional on coronavirus outbreaks". Authors: Diego, Andrade; Fernanda, Marx; Maté, Orsolya. Medical Conference

- for PhD Students and Experts of Clinical Sciences 2021. Book of Abstracts, pp. 96. Pécs, Hungary. ISBN: 978-963-429-653-9
7. "Building Design for People with Dementia". Authors: Fernanda Marx Donát Rétfalvi. 9th Interdisciplinary Doctoral Conference (IDK), 2020. Book of Abstracts, pp. 345. Pécs, Hungary. ISBN 978-963-429-582-2
 8. "Architectural Design for People with Dementia: Case Study Analysis and Literature Review". 16th Miklós Iványi International PhD / DLA Symposium 2020. Book of abstracts, pp. 62. Pécs, Hungary. ISBN 278-963-429-578-5
 9. "Design for People with Dementia in Hungary". Authors: Fernanda Marx, Donát Rétfalvi. XXIII. Tavaszi Szél Konferencia 2020 - Book of Abstracts, pp. 534. Budapest, Hungary. ISBN: 978-615-5586-70-5
 10. "Dealing with Early Dementia Symptoms in Studies Related to the Environment". Authors: Fernanda Marx, Diego Andrade, Donát Rétfalvi. Medical Conference for PhD Students and Experts of Clinical Sciences 2020. Book of Abstracts, pp. 28. Pécs, Hungary. ISBN 978-963-429-544-0
 11. "Alzheimer's Disease and the Elderly Institutionalization". Authors: Diego Micael Barreto Andrade, Fernanda Marx Andrade, Marta de Brito Nascimento, LaísSilva dos Santos, Orsolya Maté. 8th Interdisciplinary Doctoral Conference (IDK 2019). Book of Abstracts, pp. 128. Pécs, Hungary. ISBN 978-963-429-374-3
 12. "People with Dementia as Active Participants in Researches Related to Built Environment". Authors: Fernanda Marx, Donát Rétfalvi. 15th Miklós Iványi International PhD / DLA Symposium 2019. Book of Abstracts, pp. 29. Pécs, Hungary. ISBN: 978-963-429-449-8

CONFERENCE PRESENTATION AND ATTENDANCE



Image source: Personal Archive

ATTENDANCE & PRESENTATION

- 18th Miklós Iványi International PhD & DLA Symposium. 3rd - 4th November 2022. Pécs, Hungary.
- 17th Miklós Iványi International PhD & DLA Symposium. 25th - 26th October 2021. Online.
- Medical Conference for PhD Students and Experts of Clinical Sciences. 15th May 2021. Online.
- 9th Interdisciplinary Doctoral Conference (IDK 2020). 27th - 28th November 2020. Online.

- 16th Miklós Iványi International PhD / DLA Symposium. 26th - 27th October 2020. Online.
- Medical Conference for PhD Students and Experts of Clinical Sciences. 16th -17th October 2020. Online.
- 15th Miklós Iványi International PhD / DLA Symposium. 28th-29th October 2019. Pécs, Hungary.
- Dementia Lab 2019 Conference. 21st -22nd October 2019. Eindhoven, Holland.⁷
- 6th International Academic Conference on Places and Technologies. 9th-10th May 2019. Pécs, Hungary.

ATTENDANCE

- Dementia Lab 2022 conference. 20th - 22nd September 2022. Leuven, Belgium.
- VELUX Build for Life Conference. 15th - 17th November 2021. Online.
- Dementia Lab 2021 conference. 18th - 29th January 2021. Online.
- Art of Ageing 2019. 2nd – 5th October 2019. Pécs, Hungary

⁷ Presentation of Person Story, which was the personal motivation for the development of this study. The personal Story is attached to the dissertation in Annex 2.



Image source: Personal Archive

AWARDS

BEST PRESENTATION AWARD

Marx, Fernanda. "Overview of Hospital Design and the Impact of the Covid-19 Outbreak." - Winner of Best e-poster session 1 presentation at the Medical Conference for PhD Students and Experts of Clinical Sciences 2021. 15th May 2021.



EXCELLENCE SCHOLARSHIP AWARD

- "UP FEIT Excellence Scholarship 2020", for the 2020/2021 academic year, awarded by the Faculty of Engineering and Information Technology at the University of Pécs.

COMPETITIONS AWARD

First Place Hackathon

- Awarded 1st place at the ITD Health Innovation Days Hackathon, competition, Pécs, Hungary, 2020.

Third Place Hackathon

- Awarded Bronze Prize at the EIT Health Innovation Day Winner's Event Hackathon European competition, 2020.⁸



MEMBERSHIPS

- International Student Ambassador at University of Pécs 2019/2021
- Stipendium Hungaricum Mentor at University of Pécs 2019/2021

⁸ Award recognition in the media:

<https://www.pecsma.hu/tudomany/europai-dijat-ert-a-pte-s-cukorbeteg-tamagotchi/>
<https://aok.pte.hu/en/egyseg/490/hir/13336>

REFERENCES

- Algase, D. L., Beattie, E. R., & Therrien, B. (2002). Environmental interventions to improve wandering and restlessness behavior in nursing home residents with dementia. *The Gerontologist*, 42(6), 761–768.
- Alzheimer's Disease International. (2018). *World Alzheimer Report 2018. The state of the art of dementia research: New frontiers*.
- Alzheimer Europe. (2019). Dementia in Europe Yearbook. Estimating the prevalence of dementia in Europe. *Alzheimer Europe*, 108.
- Alzheimer Europe. (2021). *Dementia in Europe Yearbook 2021*.
- Bardin, L. (1977). *Análise de Conteúdo* (1st ed.). Edições 70.
- Conrad, Q., & April, D. (2018). *Abbeyfield Winnersh: understanding how people live with dementia in care environments*. June, 11. <http://www.scie-socialcareonline.org.uk/abbeyfield-winnersh-understanding-how-people-live-with-dementia-in-care-environments/r/a110f00000NXpTBAA1>
- Day, K., Carreon, D., & Stump, C. (2000). The therapeutic design of environments for people with dementia: A review of the empirical research. *Gerontologist*, 40(4), 397–416. <https://doi.org/10.1093/geront/40.4.397>
- Digby, R., & Bloomer, M. J. (2014). People with dementia and the hospital environment: The view of patients and family carers. *International Journal of Older People Nursing*, 9(1), 34–43. <https://doi.org/10.1111/opn.12014>
- Evans, S., Waller, S., Bray, J., & Atkinson, T. (2019). Making homes more dementia-friendly through the use of aids and adaptations. *Healthcare (Switzerland)*, 7(1), 1–11. <https://doi.org/10.3390/healthcare7010043>
- Fleming, Richard; Bowless, J. (1987). UNITS FOR THE CONFUSED AND DISTURBED ELDERLY: DEVELOPMENT, DESIGN, PROGRAMMING AND EVALUATION. *Australian Journal on Ageing*, 6(4), 25–28.
- Fleming, Richard; Zeisel, John; Bennett, K. (2020). *World Alzheimer Report 2020 - Design, Dignity, Dementia: Dementia-related design and the built environment*

Vol II case studies. II.

- Fleming, R., & Purandare, N. (2010). Long-term care for people with dementia: Environmental design guidelines. *International Psychogeriatrics*, 22(7), 1084–1095. <https://doi.org/10.1017/S1041610210000438>
- Fleming, R., Zeisel, J., & Bennet, K. (2020). *World Alzheimer Report 2020 - Design, Dignity, Dementia: Dementia-related design and the built environment. I.*
- Godwin, B. (2014). Color consultation with dementia home residents and staff. *Quality in Ageing and Older Adults*, 15(2), 102–119. <https://doi.org/10.1108/QAOA-04-2013-0006>
- Greasley-adams, C., Bowes, A., Dawson, A., & McCabe, L. (2014). *Good practice in the design of homes and living spaces for people with dementia and sight loss.*
- Grey, T., Xidou, D., Kennelly, S., & Mannion, V. (2018). *Dementia Friendly Hospitals from a Universal Design Approach: Design Guidelines.*
- Gyarmati, A. (2019). *Ageing and Care for the Elderly in Hungary General Survey and Problems.*
- Halsall, B., & MacDonald, R. (2015). *DESIGN for DEMENTIA Volume 1 - A Guide with helpful guidance in the design of exterior and interior environments (Vol. 1).* The Halsall Lloyd Partnership.
- Hellstrom, Ingrid; Nolan, Mike; Nordenfelt, Lennart; Lundh, U. (2007). Ethical and Methodological Issues in Interviewing Persons with Dementia. *Nursing Ethics*, 8(5), 49–56.
- Howard, J., & Strauss, A. (1975). *Humanizing Health Care.* John Wiley & Sons.
- Hung, L., Phinney, A., Chaudhury, H., Rodney, P., Tabamo, J., & Bohl, D. (2017). “Little things matter!” Exploring the perspectives of patients with dementia about the hospital environment. *International Journal of Older People Nursing*, 12(3), 1–11. <https://doi.org/10.1111/opn.12153>
- Iwamoto, Y., & Hoshiyama, M. (2012). Time Orientation During the Day in the Elderly with Dementia. *Physical & Occupational Therapy In Geriatrics*, 30(3), 202–213.

<https://doi.org/10.3109/02703181.2012.713453>

- Lee, K. H., Boltz, M., Lee, H., & Algase, D. L. (2017). Is an Engaging or Soothing Environment Associated With the Psychological Well-Being of People With Dementia in Long-Term Care? *Journal of Nursing Scholarship*, 49(2), 135–142. <https://doi.org/10.1111/jnu.12263>
- Liu, L., Gauthier, L., & Gauthier, S. (1991). Spatial disorientation in persons with early senile dementia of the Alzheimer type. *The American Journal of Occupational Therapy*, 45(1), 67–74. <https://doi.org/10.5014/ajot.45.1.67>
- Marquardt, G; Bueter, K; Motzek, T. (2014). Impact of the design of the built environment on people with dementia: an evidence-based review. *Health Environ Res Des J*, 8(1), 127–157.
- Marquardt, G. (2011). Wayfinding for people with dementia: A review of the role of architectural design. *Health Environments Research and Design Journal*, 4(2), 75–90. <https://doi.org/10.1177/193758671100400207>
- Marquardt, G., & Viehweger, A. (2014). Architektur für Menschen mit Demenz: Planungsgrundlagen, Praxisbeispiele und zukünftige Herausforderungen: Beiträge zur Tagung am 22.05.2014 in Dresden. In *Architektur für Menschen mit Demenz: Planungsgrundlagen, Praxisbeispiele und zukünftige Herausforderungen: Beiträge zur Tagung am 22.05.2014 in Dresden*. <https://books.google.de/books?id=LLqdoAEACAAJ>
- Mitchell, L., Burton, E., Raman, S., Blackman, T., Jenks, M., & Williams, K. (2003). Making the outside world dementia-friendly: Design issues and considerations. *Environment and Planning B: Planning and Design*, 30(4), 605–632. <https://doi.org/10.1068/b29100>
- Numbers, K., & Brodaty, H. (2021). The effects of the COVID-19 pandemic on people with dementia. *Nature Reviews Neurology*, 17(2), 69–70. <https://doi.org/10.1038/s41582-020-00450-z>
- Nygård, L. (2006). How can we get access to the experiences of people with dementia? *Scandinavian Journal of Occupational Therapy*, 13(2), 101–112.

<https://doi.org/10.1080/11038120600723190>

Perrin, T., May, H., & Anderson, E. (2008). *Wellbeing in Dementia: An Occupational Approach for Therapists and Carers* (C. Livingstone (ed.); 2nd ed.). Elsevier.

Richardson, R. J. (1999). *Pesquisa Social Métodos e Técnicas* (3a.). Editora Atlas S.A.

Sloane, P. D., Zimmerman, S., Suchindran, C., Reed, P., Wang, L., Boustani, M., & Sudha, S. (2002). The public health impact of Alzheimer's disease, 2000-2050: Potential implication of treatment advances. *Annual Review of Public Health*, 23, 213–231. <https://doi.org/10.1146/annurev.publhealth.23.100901.140525>

Torrington, J. (2006). What has architecture got to do with dementia care?: Explorations of the relationship between quality of life and building design in two EQUAL projects. *Quality in Ageing and Older Adults*, 7(1), 34–48. <https://doi.org/10.1108/14717794200600006>

UN World Bank. (2019). World Population Ageing 2019. In *World Population Ageing 2019*. http://link.springer.com/chapter/10.1007/978-94-007-5204-7_6

van Buuren, L. P. G., & Mohammadi, M. (2021). Dementia-Friendly Design: A Set of Design Criteria and Design Typologies Supporting Wayfinding. *Health Environments Research and Design Journal*, 1–23. <https://doi.org/10.1177/19375867211043546>

Van Hoof, E. I. J., & Kort, H. S. M. (2009). Supportive living environments: A first concept of a dwelling designed for older adults with dementia. *Dementia*, 8(2), 293–316. <https://doi.org/10.1177/1471301209103276>

van Hoof, J., Sprong, M., Marston, H., Janssen, B., van Hoof, M. R., Marston, H. R., & Janssen, B. M. (2015). The use of mood boards to study housing needs of nursing home residents with dementia. *International Journal for Innovative Research in Science & Technology*, 2(04), 62–71.

Waller, S., & Masterson, A. (2015). HOSPITAL INFRASTRUCTURE Designing dementia-friendly hospital environments. *Future Hospital Journal*, 2(1), 63–71.

Wiener, J. M., & Pazzaglia, F. (2021). Ageing- and dementia-friendly design: theory and

evidence from cognitive psychology, neuropsychology and environmental psychology can contribute to design guidelines that minimise spatial disorientation. *Cognitive Processing*, 22(4), 715–730.
<https://doi.org/10.1007/s10339-021-01031-8>

World Health Organization. (2012). *Dementia: A public health priority*. WHO Press.

World Health Organization. (2017). *Global action plan on the public health response to dementia*.

Zeisel, J. (2010). *I'm Still Here: Creating a better life for a loved one living with Alzheimer's* (Kindle). Brown Book Group.

SITES

Központi Statisztikai Hivatal (2021). Budapest: Területi különbségek a koronavírus-járvány árnyékában. Retrieved on November 1st, 2021, from https://www.ksh.hu/docs/hun/xftp/idoszaki/ter_kul_jarvany/index.html

FelejteK.hu ALZHEIMER-KÓR – EGYÜTTÉLÉS A DEMENCIÁVAL Retrieved on November 1st, 2021, from <https://www.felejteK.hu/adatok-es-tenyek.html>

Institute for Health Metrics and Evaluation (IHME). Retrieved on November 1st, 2021, from <http://www.healthdata.org/hungary?language=41>

The following storytelling was presented by the author at the Dementia Lab 2019 conference, during the personal story session. The conference was held in Eindhoven, Netherlands, and the presentation happened on the 22nd of October 2019.

FOREVER WITH ME, DAISY

I was feeling satiated after the delicious Sunday lunch. I was still at the table in the living room, watching my grandmother carefully remove the dishes when I asked:

- "Grandma, what day is it?"

And she promptly answered me - "It is Sunday."

"I know Nanny. I want to know what day of the month it is."

And she looked at me, confused - "Today is Sunday."

Every Sunday I used to have lunch at my grandmother's house. She used to prepare everything by herself. Lunch, dessert, the entire table. All extremely flawless, by the way. The house was always in order, and the garden was always impeccable. The low external fancy of her house would not let me lie. Now and then it was possible to see the lady in her early 70s crouched while picking up any fallen leaves in the yard. My grandmother has always been a very active person, she dedicated her life to work and the care of her three children. Even during a complicated time for women, my grandmother, perhaps even without realizing it, was ahead of her time. In the mid-fifties, she was one of the first women to get a driver's license in Rio de Janeiro. "But I have been driving since I was 14", she used to say. The woman who was driving herself to work was also a beauty pageant in her city. Beautiful, graduated in law and married. My grandmother is living proof that we can conquer everything in life.

One of my earliest memories of her involves purses, shoes, and makeup. I remember being on the floor of my grandparents' living room, immersed in a world of my grandma's makeup. I was testing different lipsticks, shadows, and blushes while she was cooking with Silvio Caldas playing on the radio. However, my grandmother was not as calm as she seemed. Many times, I heard coming out of her mouth phrases like "I want it that way, and this is my final word!". Although she never raised her voice to me, I know that my grandmother had a strong personality. Nothing happened without her consent. "It is because she was raised by Germans" my grandfather used to say. My grandmother was raised in Brazil, but her parents, a German man, and an Austrian woman were immigrants during the world war.

It has been ten years since my last Sunday lunch at my grandmother's house. Gradually the garden was getting full of leaves. Little by little, we lost the sweet and authoritarian woman. My grandmother is now 85 years old, and she lives with twenty other ladies, but she does not know that. Whenever I return to Rio de Janeiro, I visit her at her new nursing home. She does not seem to remember me, but she always seems very happy. If there is a positive side to all of this, it is the fact that she does not suffer. We suffer.

The diagnosis came a few days after our Sunday lunch. We noticed her always very confused, sometimes she forgot trivial things like the year we were or her cat's name. One day my grandmother went out to leave the garbage outside. A few minutes later she was found by a neighbour, and he told us she was completely disoriented. My grandmother spent most of her life at the same address, living in a modernist-style house, designed by my grandpa, in a residential and quiet neighbourhood. Upon being asked by her neighbour, my grandmother replied that she was going to her mother's home. She even gave him the exact address. My great-grandmother passed away years ago and the house that my grandmother was talking about was demolished even before her death. How could she still remember the correct address in which she spent part of her childhood, but she was not able to remember her current address?

In an attempt to slow down the process, we did everything we were told to. Activities of occupational therapy, physiotherapy, medications, and prayers.

Everything. It is difficult to explain how the process works because it is not continuous. One day she frightened us when she said she did not recognize anyone in her bedside photo. It was us, the whole family, in the picture that had been by her side of the bed for years and years.

- "Nanny, who is this person?" - I pointed my finger at her in the photo.

- "I do not know. I have never seen this person." - She replied with disdain, not recognizing herself.

Then in the next week, when we were already feeling hopeless, she was able to name everyone in the picture. And this is how the process is. A process of losses and gains. We used to paint together until the day she could not hold the pencil anymore. Ironically, one of her favourite pastimes was the memory game. After a while, the game needed to be played with all the cards facing up so she could find the matching pairs. Nowadays she does not like this game anymore.

What are we without our memory? I have this question on my mind every day. I learned from my grandma's illness that every second is the only present time that exists. The next second will not exist anymore. Now I know that she is my grandmother, I do not know about tomorrow. And this is the reason why I am here, to remind the warrior woman that she was and that she still is.

I left my country to seek answers, and my doctoral research focused on the "Design for dementia" is being developed in Hungary. I take advantage of my lucidity to contribute to society with something that I face in my personal life and that now is also part of my



professional and academic life. Today I am distant from the people I love the most, and to never forget this love, I decided to mark on my skin something simple, but with great meaning. A flower, delicate, beautiful, and strong.

Forever with me, Daisy.



ACKNOWLEDGMENTS

I would like to express my heartfelt gratitude to the individuals and institutions who have played a crucial role in the completion of this work.

First and foremost, I extend my sincere appreciation to my supervisor Donát Rétfalvi for his support, guidance, and encouragement throughout this journey. His invaluable insights, feedback, and constructive criticism have significantly enriched the quality of this work.

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Furthermore, I would like to express my profound gratitude to my family for their unconditional love and understanding. Their faith in me even from miles away has been a driving force behind my success.

Lastly, I extend my thanks to the friends I made in Hungary throughout this journey. They have been wonderful companions, sharing their experiences and helping me grow both personally and professionally. Their presence has made this journey abroad an enriching and an unforgettable experience.