Designing for Care in an Inclusive Environment
Dwelling Graduation Studio_AR3AD110

Multigenerational Living for the Sandwich Generation

Research

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Personal Motivation

The graduation studio: Design for Care in an inclusive environment, focuses on health and care, aiming to design a healthier and more inclusive living environment. When it comes to medical care, the care recipient's needs are usually the primary consideration, the needs and discussions of the caregiver themselves are relatively rare compared to those of the care recipient. However, in an aging society, caregivers are a critical part of the entire healthcare system because, without them, there would be no one to care for the elderly. Therefore, one question that came to my mind was, "Who will care for the caregivers?" Given the need to create a more inclusive and healthy living environment, we should not only care for the elderly but also consider the caregivers in the relationship.

Caring for the elderly is global; in my country, Taiwan, it has been a topic of considerable discussion in recent years. In our culture, caregivers are usually family members, such as the children of the elderly, and my family is no exception. My family was originally a typical nuclear family, consisting of my parents and two children; however, because my grandmother was sick and needed care, she moved from the countryside to the city to ensure we could care for her. Suddenly our lives changed, and we each had another role to play: family caregiver. We distributed the care work. For example, my mother bathed my grandmother, my father prepared meals, and my brother and I assisted with some of the relatively simple tasks, which gradually became a burden, reducing our time and compressing our living space because of the care work. For example, because Grandma was not well enough to go up to the upper floor, we placed a single bed in the corner of the dining room on the ground floor as Grandma's bedroom, which caused us to use the dining room less frequently. Sometimes we had to move the eating space to the first floor to avoid waking her up. As a result, our quality of life is not as good as it used to be because our living space is squeezed. In addition to the burdens mentioned earlier and life changes, caregiving also causes physical and mental health decline, such as complaints and unstable emotions from grandmothers, which increase our psychological burden. Apart from the author's family experience, there have been many news reports in Japan about caregivers dying earlier than the elderly being cared for and even about family caregivers choosing to end the lives of the elderly because they could not cope with the stress of caregiving (Etsuko, 2016).

Family members are responsible for caregiving, a common concept in Asian societies. Although more and more long-term care facilities have started to provide care for the elderly in recent years, the caregiving work is still done mainly by children of the elderly, which is very different from the Dutch society's attitude towards care work. The government caring for the elderly seems to be the natural social consensus in the Netherlands. However, since the health care reform in 2015, the care of the elderly in the Netherlands is no longer the sole responsibility of the government but is slowly shifting to the citizens. The government encourages aging in place, and there are no more nursing homes, as well as a shortage of healthcare professionals, so the care work partly falls on the family members of the elderly. This phenomenon may only increase, so in recent years, there have been many such as intergenerational cohabitation, retirement housing, and community care to replace nursing homes. I look at the issues of the elderly, caregiving, and housing from my own cultural background and speculate that perhaps having family members living under one roof is one possible solution.

Since aging in place and living with family members is likely to be one of the future models of an aging society, the space and living environment of the home is critical because when the built space does not meet the requirements, the elderly may be forced to move to an institution or renovate the house at their own expense. For example, there are too many barriers in the home, such as stairs, insufficient space for the whole family to live together, or less privacy for people to cohabitate. Therefore, in terms of the built environment, architects may be able to think about the living environment so that the space of the future home can be flexible enough to face the needs of different stages of life and meet the needs of care, enhancing the overall quality of care and realizing the vision of family living together, mutual care and aging in place.

Abstract

Caring for the elderly has always been a topic of great discussion. Demographic changes in an aging society have resulted in the growing phenomenon of the Sandwich Generation. The middle-aged generation cares for their aging parents and children and is usually one of the groups providing informal care. The burden of caregiving gradually harms their health and eventually leads to a decline in the quality of care and life for both the caregiver and the elderly. In order to realize aging in place and solve the problem of insufficient nursing homes in Dutch society due to the shortage of healthcare professionals and the reduction of healthcare budgets by the government, it is necessary to focus on the needs of these informal caregivers, who are sandwiched between two generations, in addition to the elderly. Furthermore, to solve the problem of housing for the elderly, apart from intergenerational cohabitation (for people without blood ties), retirement housing, and kangaroo houses, which have been highly discussed in recent years, research has found that living together with family members who are related by blood may be one of the options.

This thesis aims to develop housing design principles that can meet the needs of caregiving and sandwich generation living together. Based on the spatial and neighborhood context of the home, the study investigates how to support the quality of life of the caregiver and the care recipient to achieve the possibility of aging in place. The research method comprises fieldwork, interviews, literature research, and case studies. The fieldwork and interviews are conducted to understand the needs of the elderly, literature research is done to obtain further objective knowledge, and case studies are used to analyze the spatial configurations, dimensions, and areas. From the results of the research methods described above, the findings show that for caregivers, adequate operating space and assistive aid help reduce the risk of injury, spatial proximity minimizes moving distances, sufficient light contributes to caregiving and health, reduced noise disturbance helps the quality of caregiver's sleep, and good ventilation prevents deterioration of indoor air quality. The most important thing for seniors is preventing falls from prolonging mobility. Toilets must be visible and easily accessible, the threshold on the floor and the intersection of different floor materials must be no high difference, and adequate lighting and easy-to-reach light switches can reduce the risk of falls.

The study of neighborhood facilities found that easily accessible facilities (e.g., public transportation, supermarkets, a library, a community center), friendly walking spaces, and adequate seating along walking routes can increase the willingness and opportunities for seniors to socialize and thus maintain mobility. Furthermore, social interaction can improve the mental health of both target groups. In terms of facilitating social interaction, increasing the number of route intersections, atrium spaces, and communal spaces in the neighborhood is possible. Lastly, for families to live together while maintaining their independence and privacy, each person must have their room, and separate entrances and adjacent kitchens and doors can mitigate disruptions due to different routines. Apart from that, the vertical and horizontal spatial arrangement can also achieve spatial independence. Furthermore, in order to avoid being forced to move out from the original home because the space cannot meet the needs of the stage of aging, the generality of spatial adaptability provides the freedom to arrange the functions of the rooms, the flexibility can change the way the space is used through simple movable partitions and moving furniture, and finally, the elasticity can expand the size of the original dwelling unit.

Key words: Sandwich generation family, informal care, informal caregiver, the elderly, living together, privacy, independence

Chapter 1
Introduction

1.1 Background

In an aging society, middle-aged adults, who care for their aging parents, raise their dependent children, and deal with their careers and family simultaneously, are the backbone of the healthcare system. This group is called the Sandwich Generation, a term cited by Dorothy Miller in 1981. Because of demographic changes, such as increasing life expectancy, delaying childbirth, shrinking family size, increasing women's employment, decentralizing healthcare service for the elderly, and rising preference for aging at home, the phenomenon of the Sandwich Generation emerges noticeably (Burke, 2017).

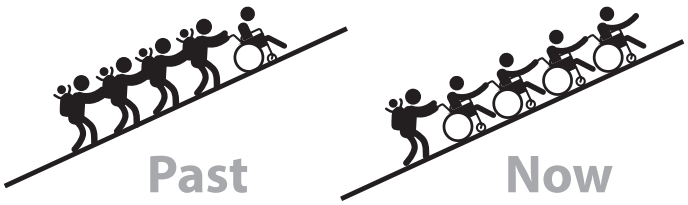


Figure 1.1 Sandwich generation in the past and present (illustrated by author)

In 2015, the Dutch government officially decentralized its healthcare policy, cut the budget for building nursing homes, promoted informal care, and encouraged the elderly to stay at home as long as possible (Maarse & Jeurissen, 2016). Moreover, because the number of formal caregivers remains almost the same and the percentage of the elderly keeps rising, there is a shortage of formal caregivers. In this context, this implies that the family members of these seniors, such as children, spouses, relatives, friends, and neighbors, may become caregivers, and they are known by the name of informal caregivers, who usually provide unpaid care and are a crucial role in the entire health system (Janse et al., 2018). However, these caregivers need to be more trained and prepared to become caregivers, especially for adult children sandwiched between two generations. The stress of caregiving, work, and role transition lead to tremendous stress than professional carers for the Sandwich generation, resulting in high morbidity and mortality rates (Montgomery et al., 1985; Schulz et al., 1999; Blaise et al., 2020). Therefore, taking good care of caregivers, considering their needs, and providing them with the support they crave is urgent in an aging society.

Figure 1.2 The way to support aging society (illustrated by author)

Recent data from CBS has shown that the percentage of adult children living with their parents gradually increases. In the Netherlands, people rely heavily on nursing homes and assume that the elderly are cared for by the government as a matter of course (Fokkema et al., 2008); therefore, it is uncommon for adult children to provide intimate care for their elderly parents and live together. (Smits et al., 2010) On the contrary, people in Asian and Southern European countries have a higher percentage of three or more generations living together in the same house. This is because of the difference in social welfare policies and culture, which leads to the difference in our obligation to care for parents. For example, for Taiwanese, it is natural for adult children to live with and care for their elderly parents. However, the concept that the elderly are cared for by the government has changed, as the government no longer builds extra nursing homes, started to encourage the elderly to age in place, and constantly appeals to adult children to think about how to care for their parents themselves; as a result, more people are considering "Kangoeroewoning" to live with their parents and provide care.

Meanwhile, the number of elderly has increased, but this is not the case for formal caregivers, implying insufficient medical professionals for the elderly. Consequently, family members are the primary provider of informal care. Furthermore, together with the shortage of housing, expensive houses, and difficulty in getting a mortgage, more and more young people choose to stay at their parent's house (Brown, 2019). Finally, another possible reason for the increase in the rate of living with parents is the increase in the population of immigrants from the Netherlands, who come from Morocco, Turkey, and Asian countries and have a different cultural backgrounds and are more willing to live with their parents than the natives (de Valk & Schans, 2008). Therefore, families that live together and care for each other may be one of the future strategies for an aging society.

1.2 Problem statement

Family caregivers pay a considerable price for caring for their aging relatives as the demand for informal care increases, the health of the caregivers and their quality of life should be considered, not merely the needs of the decrepit elderly (Canam & Acorn, 1999). Research by Xie et al. (2016) suggests that caregivers' quality of life was related to recipients' dependence. The greater the dependency, the more time and effort the caregivers devote to caregiving, which impacts mental and physical health, social and interpersonal relationships, and financial burden; the influence is even more so when both live together (Montgomery et al., 1985; Schulz & Beach, 1999; Blaise & Dillenseger, 2020). In other words, designing a home for living together should consider the space that can help caregivers with caregiving tasks, maintain the elderly's activities of daily living, provide a friendly neighborhood to enhance opportunities for interaction, and retain the privacy of individual territory.

Little attention on caregivers' Quality of life (QoL) in terms of home space

A well-planned housing design can help family members to adapt to living together with family members of different generations, which helps to alleviate family caregivers' burden (Rechavi, 2009). Most current research on family caregivers mainly focuses on support from medical or social aspects but rarely on how to support them and improve their quality of life from home design. While there is housing designed for multigenerational families or retirement housing with medical care, less attention has been paid to the space needs of caregivers who live with their parents.

Insufficient spatial consideration of stages of aging

Given the varying stages of aging leading to different capacities of daily life activities, designing home space should consider the possible needs of each phase of being older (Huber, 2008; Askar et al., 2021). Although the Dutch housing code: Woonstandaard, Woonkeur Module specifies the relevant dimensions for universal design, there is still a need to optimize space planning for possible aging stages and care needs. Housing not designed with the space needs of its occupants in mind as they age can lead to people either renovating their homes or moving to another location that will meet their needs. Regarding residential modifications, there are spatial and economic limitations to the extent of home modifications because the original homes were not designed in advance for various life courses. Therefore, dwellings should expect to adapt to different stages of aging.

Lacks Social support in the community

The role of family caregivers has an impact on their social network and social support (Amendola et al., 2011). The lack of time to socialize, the closure of interpersonal networks, and the lack of access to supporting resources due to the long hours of caregiving and exhaustion lead to the social isolation of caregivers, resulting in a greater burden and increased risk of depression. (Pinquart & Sörensen, 2003). In addition, role transitions to caregivers are usually without warning (Steiner & Fletcher, 2017). In other words, family caregivers often do not have enough time and experience to handle the caregiving task, resulting in being more stressed than professionals and more in need of social support from the family, neighborhood, and professionals. Therefore, when designing housing and community, creating opportunities for socialization and information exchange is a way to support family caregivers.

The obstacle of living together

Sharing housing implies a significant loss of privacy for all family members, which can be particularly unpopular in the Netherlands where with strong individualistic orientation (Smits et al., 2010). Own space and privacy are essential for them, which is why people refuse to live in their parent's houses (Gerards et al., 2015).

"I do not dare to invite friends over because my parents are home, and it would be awkward." (Souralová & Žáková, 2020)

There are relatively few homes designed for multigenerational households in the Netherlands. Moreover, since the trend of parent-child coresidence is likely to become a way of life, it is crucial to tackle privacy and dependence in the home space.

1.3 Goal

This research aims to formulate design guidelines for designing housing for sandwiched generation families living together in relation to care. One thing is sure the current housing is not suitable for sandwich generation families and cannot meet their needs of care. As stated previously, aging in place is the trend in the future, so designing homes that adapt to different stages of aging and life courses enable people to keep their autonomy and live longer at home. Furthermore, creating choices of various ways of living together for sandwich generation families from different cultural backgrounds is a way to keep privacy from their preferences and make an inclusive environment.

1.4 Theoretical framework

The quality of life of family caregivers

The quality of life of family caregivers and their care recipients intertwines on various levels. For example, according to the research by Canam and Acorn (1999), the quality of life for caregivers is related to mental health, physical health, social relationships, and finances, all of which correlates with the person being cared for. In addition, Fuhrmann et al.(2015) stated that the greater the need for assistance with daily activities for the elderly, the more the burden on the caregivers, which stems from social isolation, and physical and mental illness due to caregiving time and tasks. Therefore, making the elderly as independent as possible is helpful to minimize the caregiver burden (Gratão et al., 2013); and is a strategy to improve the quality of life of the family caregiver.

In addition to enhancing the autonomy of the elderly, social support is also crucial for family caregivers' quality of life. A study by Young et al. (2017) indicated that the transition of the role and unfamiliarity with caregiving tasks impact caregivers' well-being, leading to stress and burden. Meanwhile, according to a study by Morelli et al. (2019), these negative influences can be addressed by social support, including emotional support, educational training by professional caregivers, and support groups formed by other family caregivers. Research shows that family caregivers need most to be understood and provided with a platform to talk, share and acquire caregiving knowledge. When caregivers talk and share with other caregivers in the same situation, they can reduce their psychological burden and gain more caregiving knowledge through communication, relieving their psychological stress while talking to each other and improving their quality of life (Vellone et al., 2008). The research mentioned above provides profound fundamental knowledge about what factors affect caregivers' Quality of Life and how the QoL of caregivers can be improved.

The spatial requirement for care and aging

Rojo-Pérez et al. (2007) suggested that the living environment allowing the elderly to stay at home as long as possible must establish three types of measures: (1) Adapting housing to the functions of the elderly (2) Providing social services (e.g., daycare center) in the community(3) Creating a safe living environment.

The home environment is important for maintaining daily activity and health, as people spend many hours at home (Sixsmith et al., 2014; Smetcoren et al., 2020). However, people are often forced to leave their original homes because the living space no longer meets their needs. For example, caregivers may move to a kangaroo house to be close to their parents, and seniors may choose a nursing home because their original home has too many obstacles and dangers, such as stairs and thresholds.

Moreover, Pettersson and Wijk (2020) highlighted three key effects of the physical environment on caregiving: room size and proportion, the spatial configuration of the room, and important aspects to consider when designing housing. At the same time, a study showed that the most common injury to caregivers is the frequency and distance of moving the care recipient from the room to the bathroom, as the stairs and room configuration of the home make it more physically difficult (Brown & Mulley, 1997). For the elderly, spatial barriers can lead to even more severe consequences than for younger people due to the frailty and limitations of physical functions caused by aging. For example, a small threshold can lead to a fall, injuring the hip joint and limiting mobility, resulting in the need for additional care. Therefore, as research by Bohn (2008), it is essential not only to be concerned about a suitable living environment for the elderly but also factors of avoiding accidents.

The privacy and independence of living together

Privacy is the primary consideration in the home of multigenerational households (Gerards et al., 2015). Gale and Park (2010) illustrated that multigenerational living might lead to a loss of privacy, limit leisure and social activities, and dictate the rearrangement of space at home. Judd (2020) stated that privacy is not merely about having a private room but having personal territory and choice of interaction. In addition to providing enough space for multigenerational households, it is also crucial to consider the needs and lifestyles of each generation. The home must support family interaction to respond to the trend of parent-child coresidence while catering to the privacy of individuals of each generation. Gale and Park (2010) stated that the effect on interaction and privacy in a home is determined by rooms' size, acoustic quality, space division, and room adjacency.

1.5 Hypothesis

The hypothesis for this research with supporting research questions is that housing designed in a way that can accommodate sandwich generation families in a housing space associated with care, facilitate supportive networks by gathering families with the similar care situation, and extend the duration of staying in the same place, without contracting the possibility for privacy. The space of a home can support family caregivers to give better care for their parents without hurting them physically or mentally and have a good quality of life by receiving support from neighbors and the service in the building. Furthermore, the elderly can live independently in a safe environment with free barrier space and healthcare services. Sandwich generation families live together and care for each other while each member gets a private space under the housing shortage issue.

1.6 Research Question

Main question

How can a housing design contribute to the quality of life of adult children and their parents in relation to care and living together?

Sub question

1. What kind of care do adult children give to their parents?
2. What factors influence the quality of life of adults and their aging parents in terms of caregiving?
3. What spatial requirements are needed for care and adaptation to different stages of aging?
4. What kind of living arrangement can help sandwich generation families live together with privacy and independence?

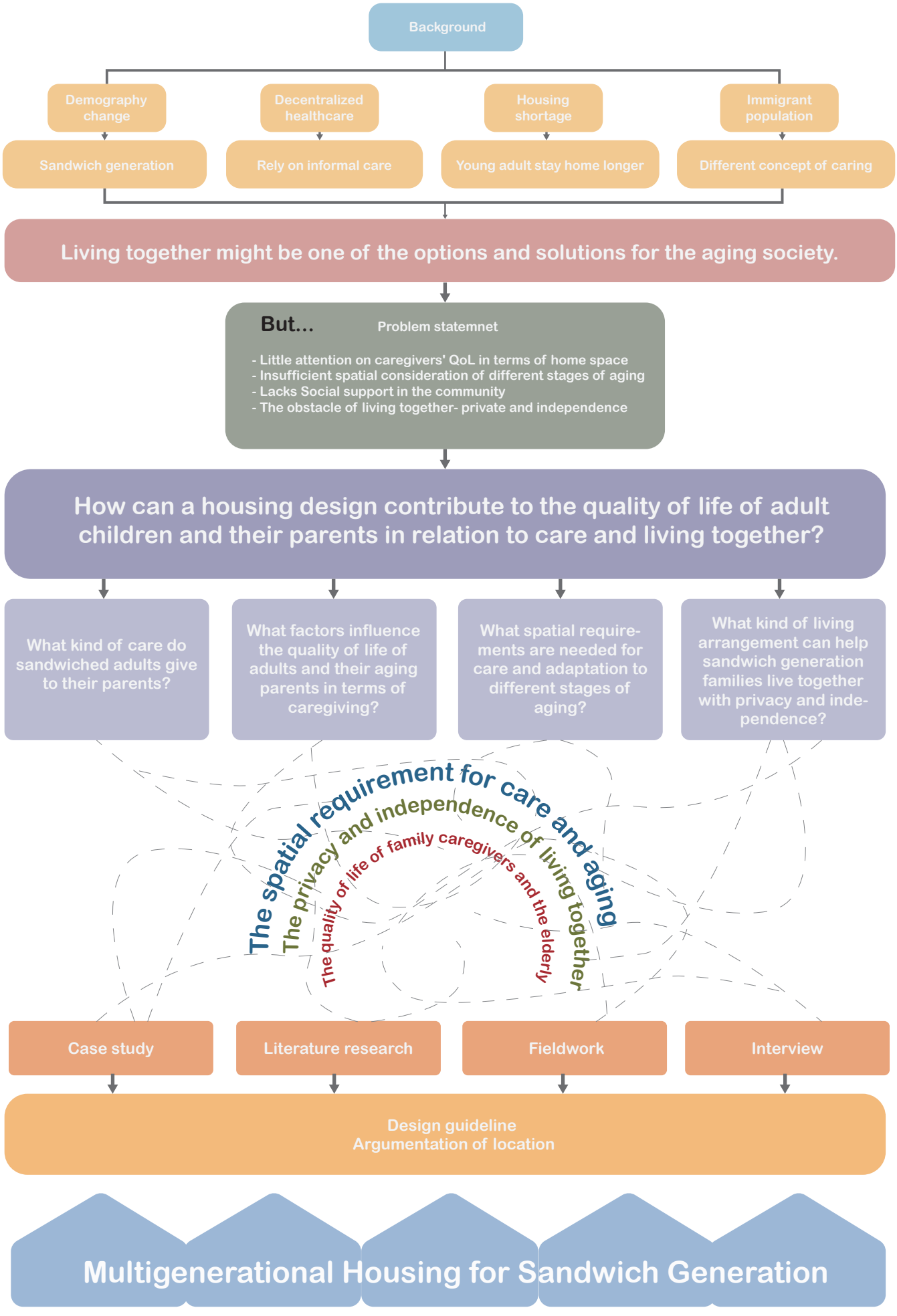


Figure 1.3 Diagram of theoretical framework (illustrated by author)

1.7 Methods

The research will be conducted through literature analysis, case studies, fieldwork, and interview.

Literature research

Following the theoretical framework, the research themes were divided into the quality of life of caregivers and the elderly, spatial needs in the care and aging process, and independence and privacy of living together. Using the Google Scholar search engine, studies and articles were searched using keywords related to the above topics. Theme 1 was searched by three keywords: quality of life, informal caregiver, and the elderly. Theme 2 was searched for the keywords of aging, home modification, and care, while theme three was searched for privacy, living together, coresidence, and independence. In order to better understand the Dutch social context, articles are searched for studies conducted by Dutch people or articles written by Dutch people so that the following design principles can be more closely related to the needs of Dutch society.

Case study

The case study included three building typologies that associate multigenerational living, healthcare for the elderly, and social facilities. The literature research forms the criteria for selecting cases. The cases of multigenerational living comprise three types of housing: the first one is an apartment with adaptivity located in Belgium, the second one is a kangaroo apartment with healthcare service in the Netherlands, and the final one is a detached house in Vietnam. This session examines the spatial configuration and room size of different types of multigenerational living under different cultures. Regarding healthcare for the elderly, the senior daycare center in the UK is selected. The objective of this case study was to obtain an idea of the spatial requirements, size, and sequence of spaces in such an architectural typology, which would provide essential data for the following design guidelines. Finally, a community center in Japan was chosen. This case is an auxiliary facility of social housing. According to fieldwork, interviews, and literature research, a way to enhance social interaction is to create space for people to meet each other. Therefore, in this case, the aim is to analyze what functions they add and how they arrange space under housing.

Fieldwork

The fieldwork was conducted in het Kampje for three days. The purpose of the fieldwork was to better understand the elderly's daily routines, their spatial needs, and their status at different stages of aging by documenting their activities from morning to evening, such as a daily meeting in the morning, eating together at noon, shopping in the supermarket, and walking in the neighborhood. The fieldwork findings are illustrated with animations of the elderly's daily routines to help readers better understand their living conditions, see Chapter 2.1.

Interview

The interview aimed to understand informal caregivers in the sandwich generation, who are the children or grandchildren of the elderly. The interviewees were the author's parents and friends from Taiwan. The interview focused on the content of the care they provided and their feedback on their experience with the care they provided. From the interview, to understand the potential living space issues involved in the caregiving process, the excerpts are summarized on pages 24 to 26 of Chapter 2.2. In addition, ten people from the Netherlands, Germany, France, the Netherlands, Denmark, Greece, and Morocco were interviewed to learn more about European views on living with parents.

Chapter 2
Fieldwork

2.1 Staying at ‘t Nieuwe Kampje

Figure 2.1 Outdoor space of het Kampje (photo by author)

Location: Loenen aan de Vecht, the Netherlands
Renovation year: 2014-2016
Typology: Care Housing
Number of unit:
Program: 77 Independent homes with kitchen; Laundry; Shared kitchens; Library; Hairdresser; Physiotherapist; Daycare; Social Conference space

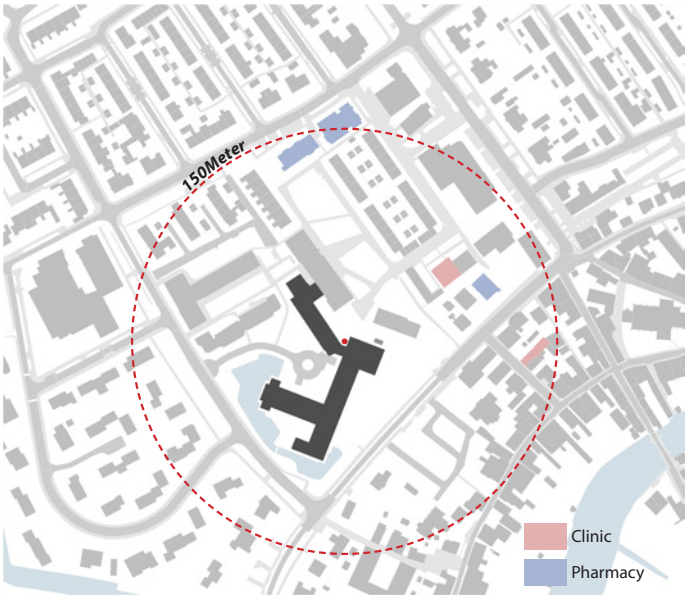


Figure 2.2 Medical facilities in the neighborhood (illustrated by author)

Figure 2.3 Other facilities in the neighborhood (illustrated by author)

This two-story building was originally a nursing home before it was transformed into the current residence for the elderly. As shown on the left, there are 77 rooms in total. In addition to the elderly, there are also a few young people who live here. Most seniors living here can walk independently and require limited care services. On the south side of the ground floor is the dementia control area, where the elderly in the control area are in the more advanced stages of dementia and require 24/7 care. On the first floor are communal spaces, such as a communal living room and kitchen, that residents can freely use. In addition to these spaces, a fitness center, caregiver's lounge, and staff offices are also on the upper floor.

The neighborhood is mainly residential, with pharmacies, clinics, supermarkets, restaurants, cafes, and stores within a radius of 150 meters (fig. 2.2, 2.3) and well-planned sidewalks. However, as Figure 2.4 shows, there are few benches or chairs along the sidewalk, a significant obstacle for seniors to go out alo ne. For example, we went to the supermarket with two residents. However, one of them suddenly lost the strength in his legs on the way back and had to sit on a chair, and there were no chairs on the road, so he ended up having to sit on his walker, which is a challenging and dangerous situation for the elderly.

Figure 2.4 The location of benches and pedestrian in the neighborhood (illustrated by author)

We stayed in the guest room at the end of the corridor for three days. The whole investigation was based on observation and participation in their social activities. During this period, we also had the opportunity to walk into their homes and interview the residents. The following paragraphs describe the residents' routine and provide a more in-depth analysis of the observations, focusing on hand-warming careful walking, and the importance of chairs, obstacles, and belongings. Chapter 2.2 contains excerpts from interviews with different ethnic groups. Finally, in Chapter 2.3, the fieldwork and interviews are summarized.

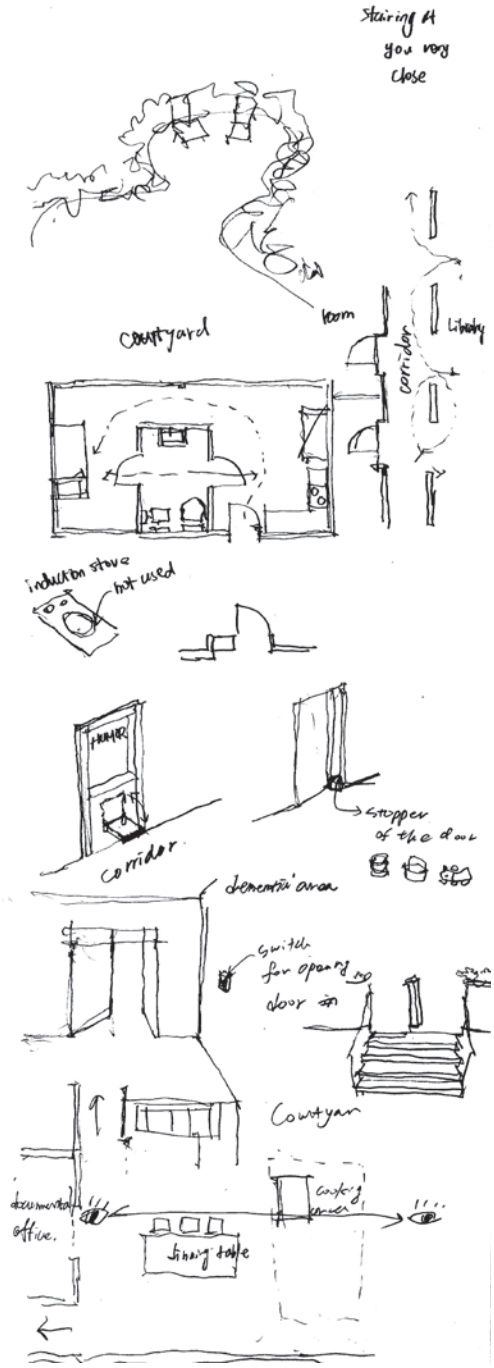


Figure 2.5 Sketches of the observation at het Kampje (illustrated by author)

Figure 2.6 Library (photo by author)

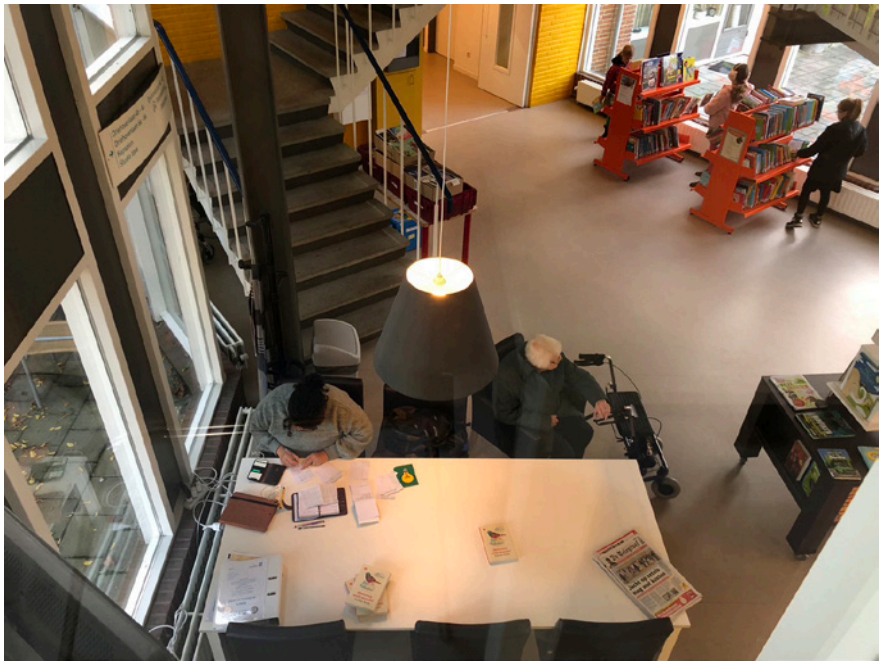


Figure 2.7 Lobby of the building (photo by author)

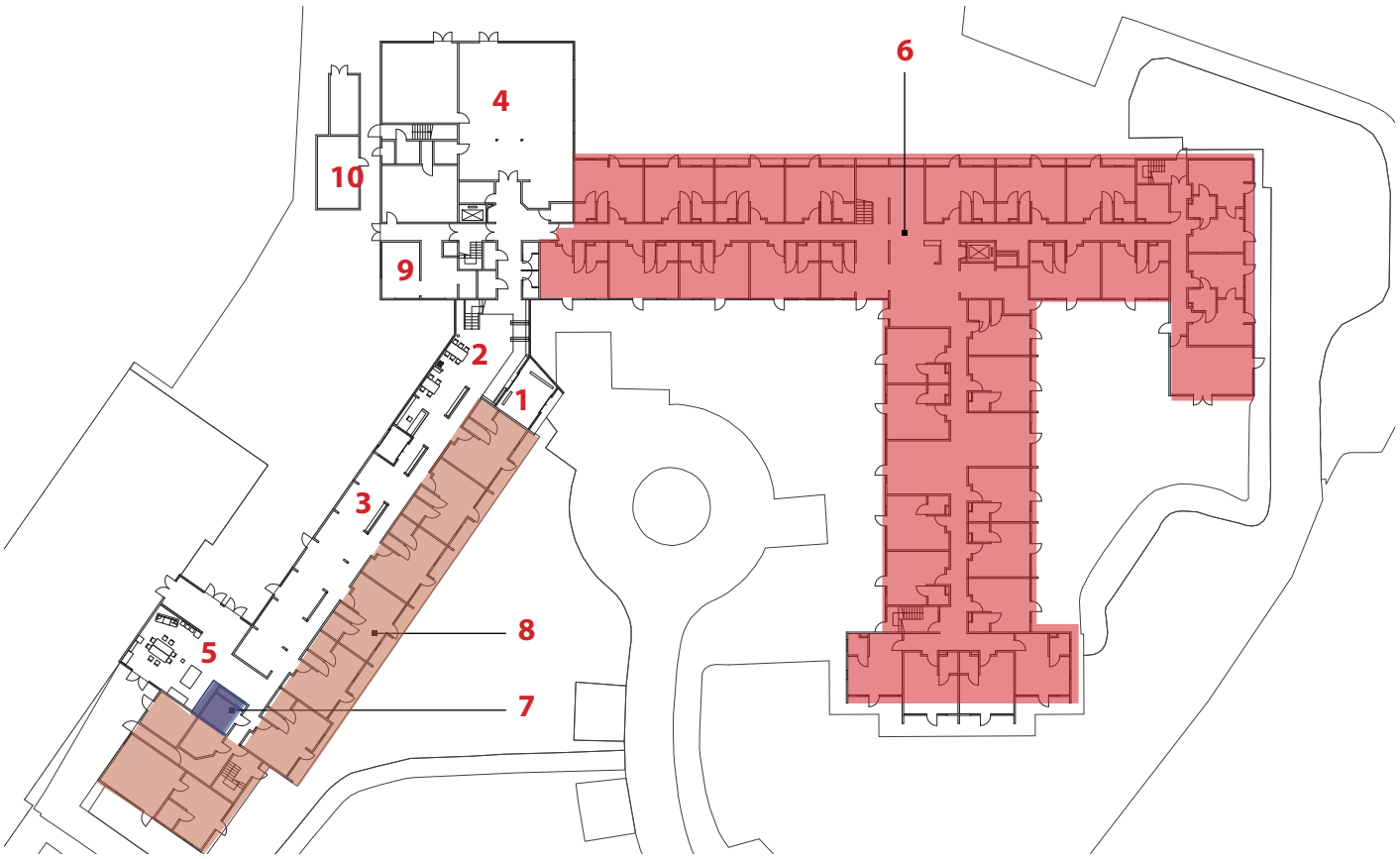


Figure 2.10 Ground floor plan (illustrated by author)

Figure 2.8 Communal living room (photo by author)

Figure 2.9 Communal workshop area (photo by author)

1. Entrance (mail room)
2. Lobby of Library
3. Library
4. Conference room
5. Communal kitchen
6. Living area for people with dementia
7. Toilet
8. Rooms for the elderly
9. Hairdresser
10. Storage
11. Therapist
12. Rest space for caregivers
13. Office
14. Meeting room
15. Communal living room
16. Workshop space

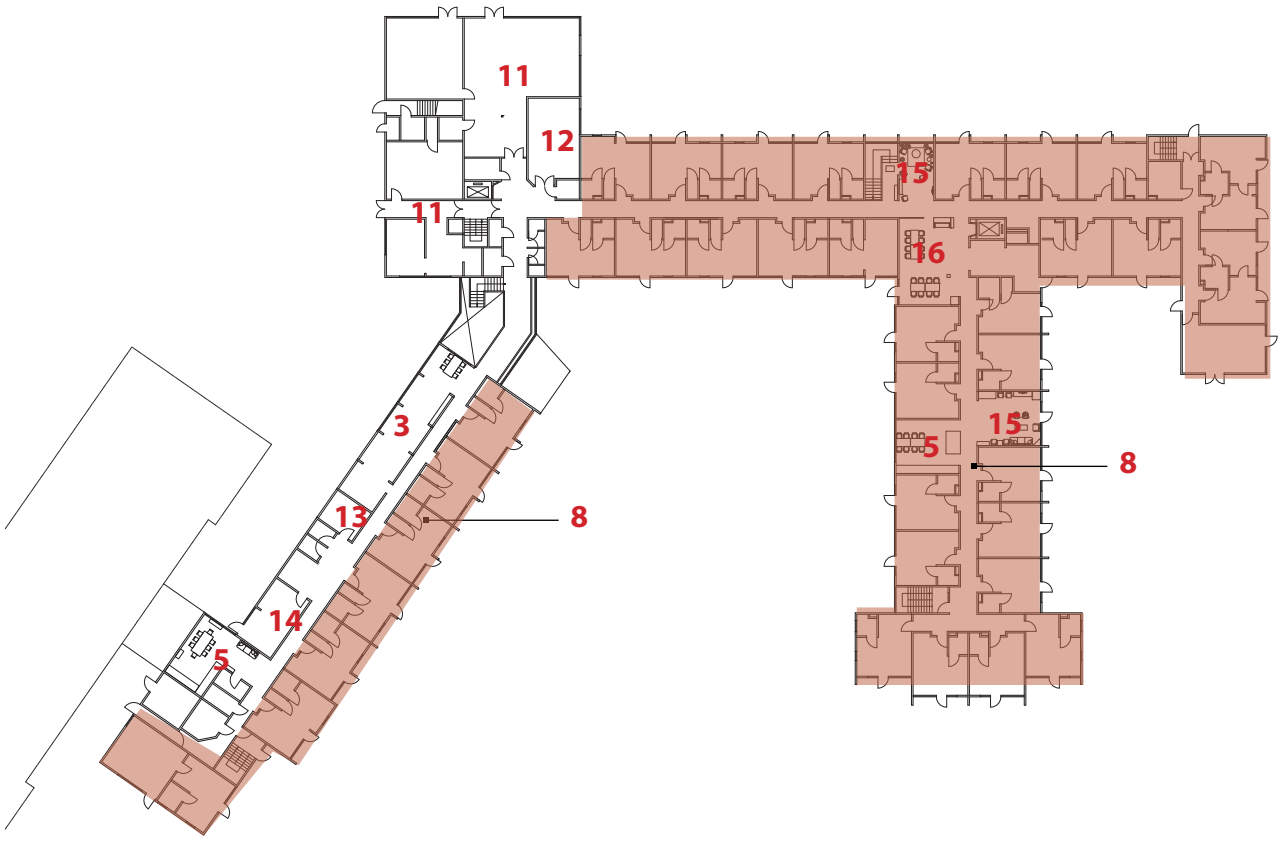
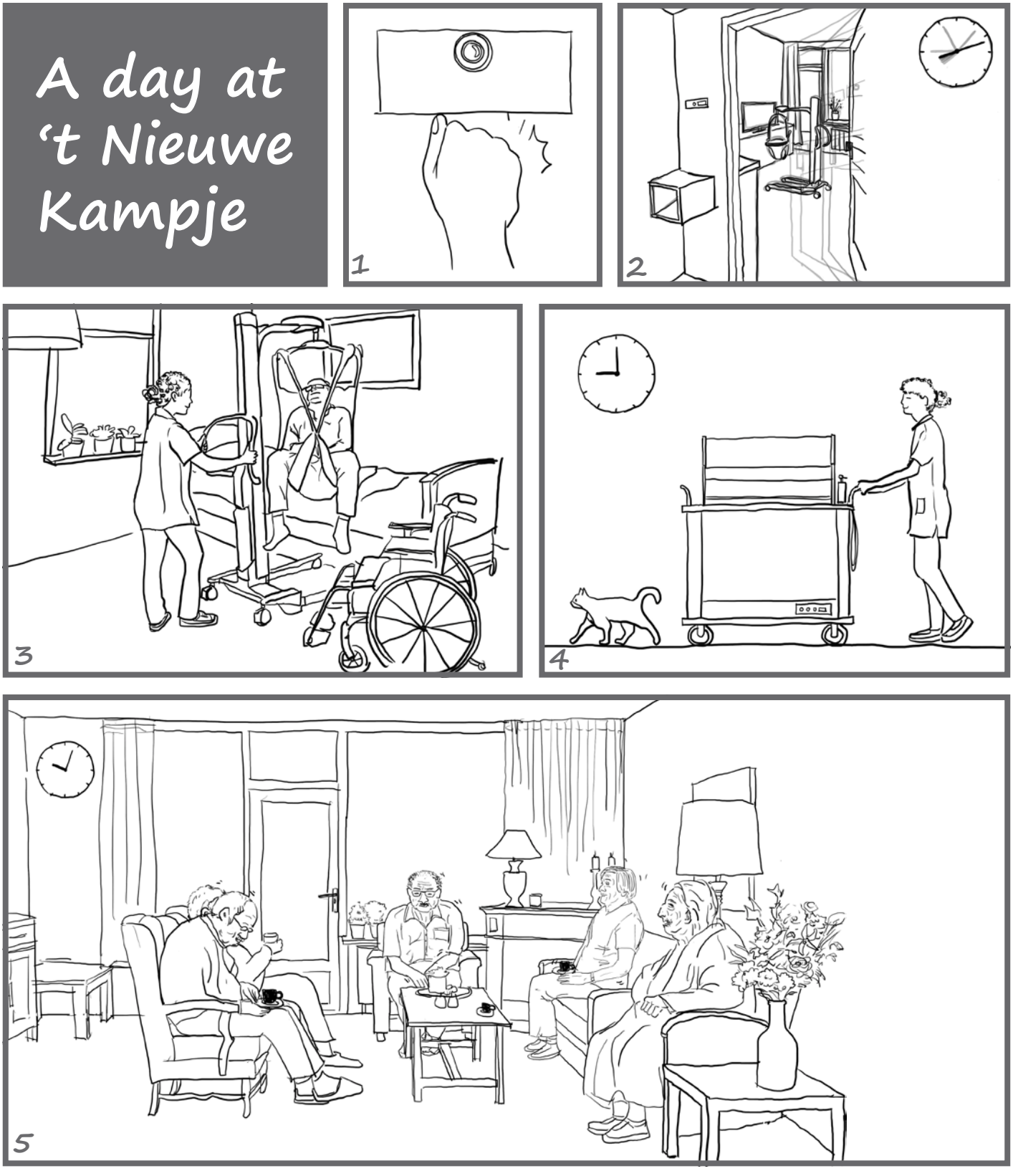


Figure 2.11 First floor plan (illustrated by author)

Routine

In the morning, around 7:40, caregivers started to wake up those residents who needed bathing service. From 7:00 to 9:00, some residents do their laundry, prepare their breakfast, or wait for the breakfast service. Then, the caregivers serve the meals to each resident who has reserved breakfast by the food cart. At 10:00, the residents who wanted to join the offee hour gathered in the communal living room.

The "activiteiten begeleider" serves coffee and cookies to the participants. In addition, they host the coffee hour by asking questions that stimulate seniors' thinking, such as the most famous food in a city and the smallest town in the Netherlands. The activities will be hosted in different spaces. For example, there was a game played in a conference room that could accommodate a large amount people. Lunchtime is around 12:00. Some residents who chose the meal service go to the communal dining room and have lunch with other residents.

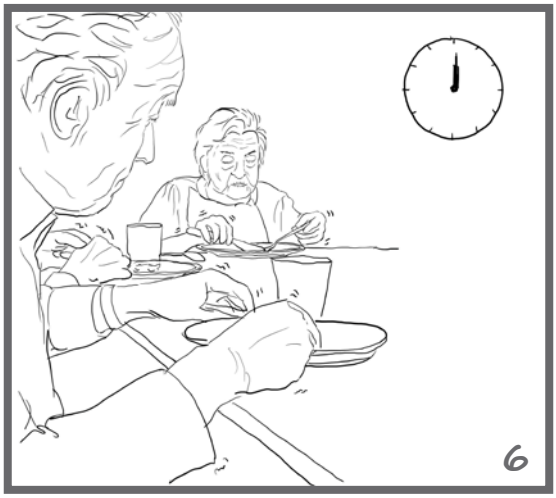


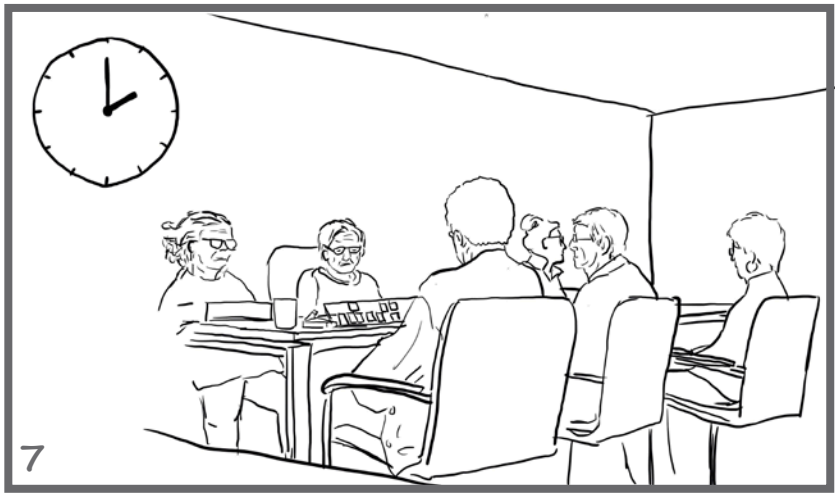
After lunch, some residents either return to their apartments or take a walk.

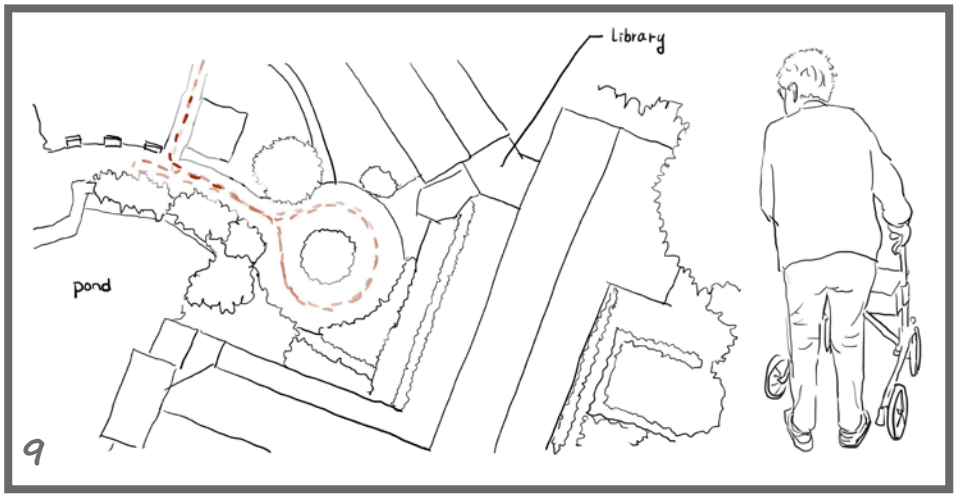
The daily workshop is at 14:00. The "activiteiten begeleider" prepared some crafts for the participant to make a piece of artwork or play board games with them. Residents can choose what they want to join or sit there and drink coffee. After the workshop, residents returned to their rooms or went to the library.

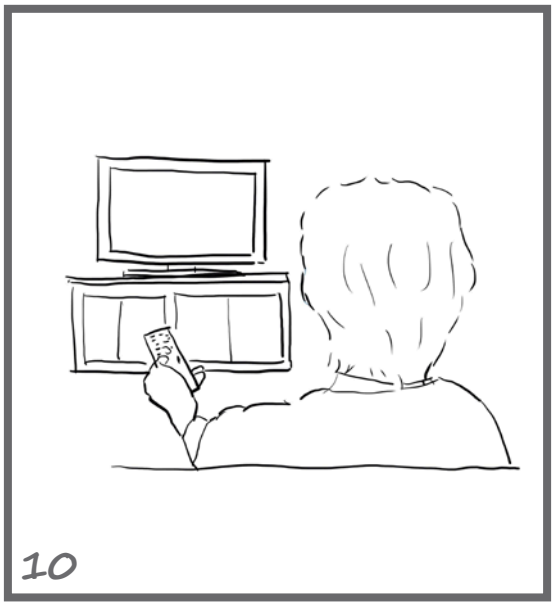
Most residents make a sandwich for dinner, while others invite friends to eat in the shared kitchen. Most of the activities after dinner were in the rooms themselves, but some played guitar in the communal kitchen. The caregivers end the day at 11 a.m. by helping residents who need care move to the bed.

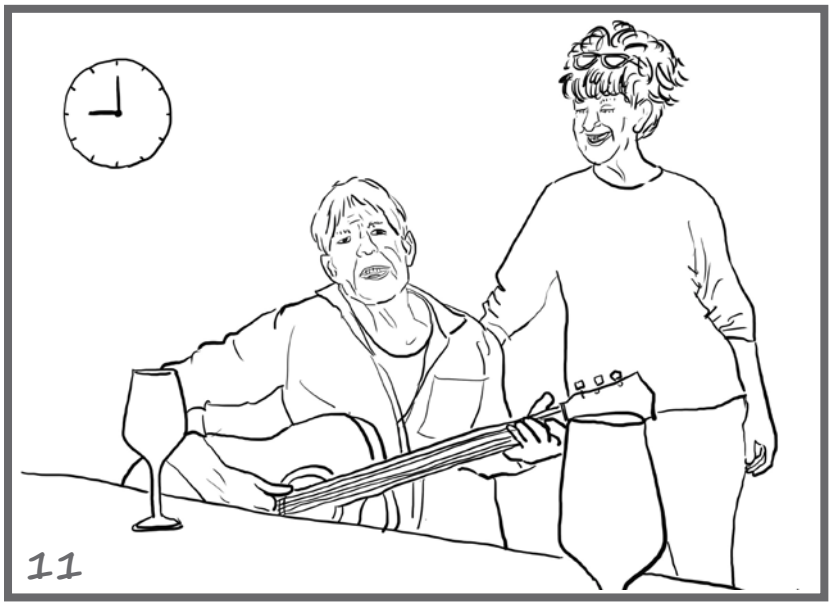
Scan this QR code to watch the animation made by author.











Keep hands warm

Some of the behavior of the elderly is related to the aging of the body. The most obvious is hand warming. Through participating in the elders' daily activities, it is easy to find that rubbing their hands, putting their hands in the middle of their legs, or crossing their arms to hold their hands under the armpits are the most common ways for them to keep warm. (Figure 2.12)

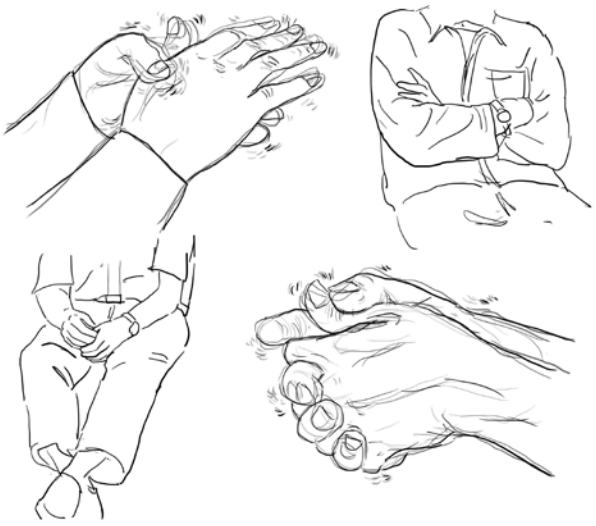


Figure 2.12 Behavior of warming hands (illustrated by author)

Walking carefully

As the body ages, the elderly's muscles are not as strong as they were young; therefore, most elderly have one or two walkers. The walker is their other pair of feet to help them to keep mobility as much as possible. The seniors tend to put their heads down to look at the ground while walking due to their weak eyesight and difficulty walking. Each step is taken with care because they can not bear to fall, which causes serious injuries, such as broken bones. One of the residents injured her wrist and ankle when she tripped over a brick protruding brick while walking. The recovery took her several months.

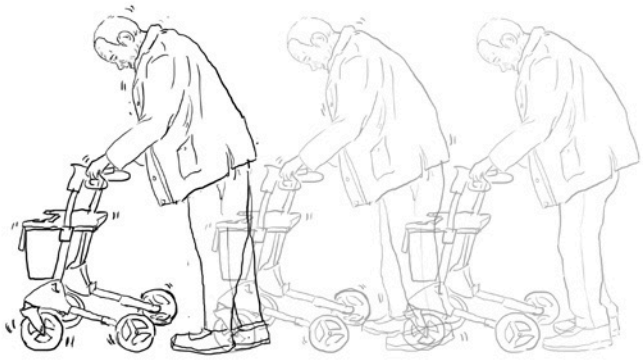


Figure 2.13 Walking with head down (illustrated by author)

Importance of chairs and its armrest

As mentioned, the walker is an essential device for the elderly, especially when there is not enough street furniture, such as benches, in the city. The walker does not only help them walk but also could be their chair. The rollators are everywhere and must be parked within the distance they can reach. Therefore, during the stay at 't Nieuwe Kampje, it is easy to find that the elderly always keeps their rollator at their side as close as possible. However, there is a lack of space for parking rollators, especially during the daily workshop. Therefore, they can only place their walker far away from the chair and then ask caregivers to bring it to them when they want to leave.

From observing the movement of sitting down and standing up, the author found that the chair's armrest is a significant function for the elderly. These movements might be easy for young people and are taken for granted, but they are relatively more difficult for seniors. That is because they stand up not only with their legs but also with their hands to push them up. Thus, the armrest is essential for them.

Figure 2.14 Sitting down and standing up with the assistance of the armrest (illustrated by author)

Figure 2.15 Placing walker near by themselves (illustrated by author)

A small barrier is a big challenge

Many small obstacles are easily overlooked in daily life. Those can be harmful to both the elderly and caregivers. For example, a caregiver whom the author interviewed during the fieldwork mentioned that although the threshold in the bathroom is not high, it is still a barrier for the caregivers operating the lifting device (Figure 2.15). She also said that the bathroom floor's material is still a risk of slipping and falling even though it is non-slip tiles. Furthermore, the space was designed without consideration of sufficient space for placing the assistive device.

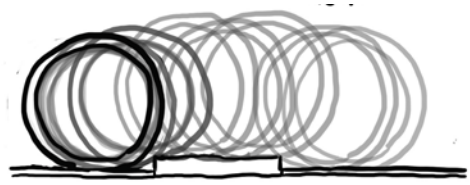


Figure 2.16 Threshold between the bathroom and bedroom as a barrier of caregiving (illustrated by author)

Figure 2.17 Slippery floor (illustrated by author)

Belongings

What are the essentials for seniors when they go out? Keys, coasters, hand towels, toilet paper and a phone are the items most often found on their wlakers. All these items are put in a place where het can be easily seen.

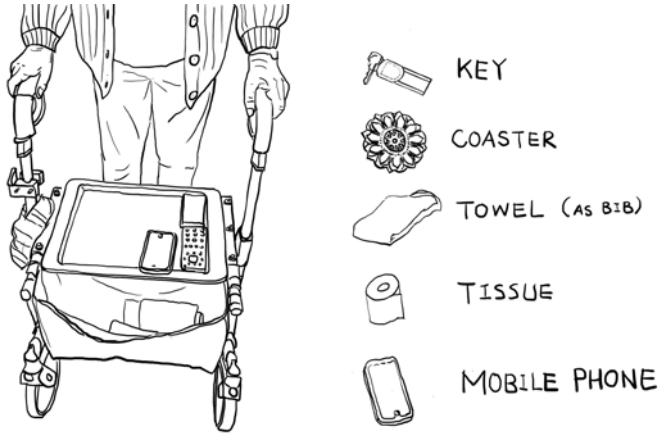


Figure 2.18 Personal belongs placed on the walker (illustrated by author)

2.3.3 Space for the elderly

During staying at 't Nieuwe Kampje, we got consent to visit some residents' rooms and had opportunities to chat with them. The excerpts of the conversations are described in this sub-chapter. In order to protect respondents' privacy, the following excerpts are antonymous, and the room numbers are placed with code numbers. The residents are from 60 years old to 80 years old. They have lived here for the half year to three years. All of them can live individually with their walkers most of the time.

The room is approximately 37 m^2, with a kitchen, barrier-free bathroom, and small storage. The open layout of the living space allows residents to arrange their space freely. Therefore, the personality and hobbies of the residents can be observed by the style of room arrangement.

While visiting the room of each household, the amount of furniture in each room exceeded the amount needed for one person could be found. The furniture took up most space of the room, squeezing walking space. However, this kind of arrangement benefits the elderly because the distance of each piece of furniture is close, making seniors walk easily without walkers. Furniture becomes another form of handrail and walking device.

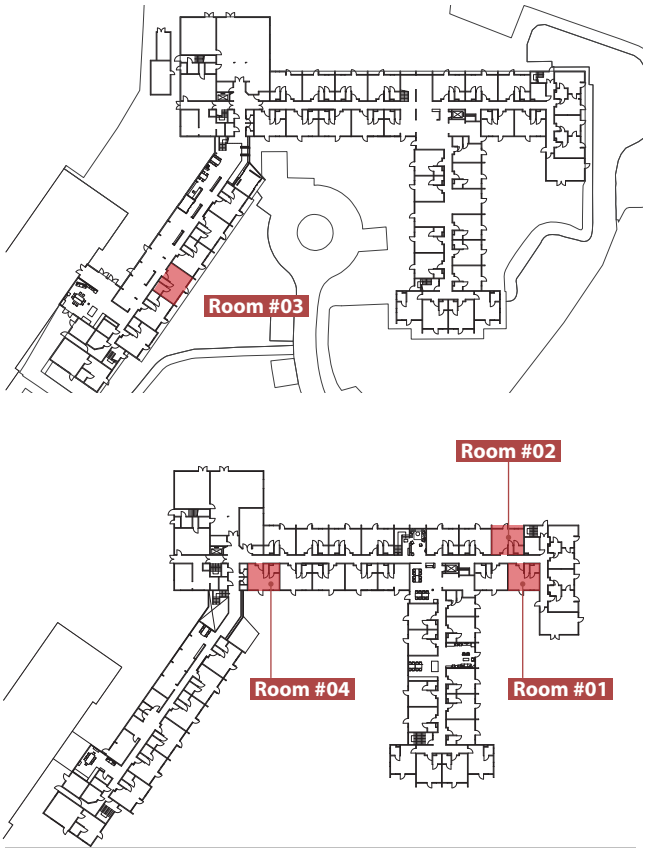
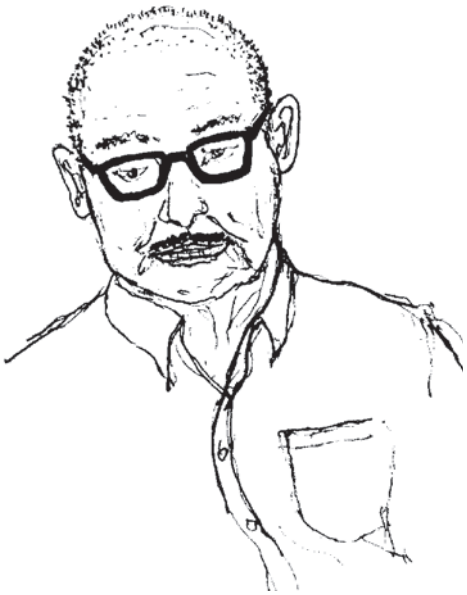


Figure 2.19 Room location of tenant who is interviewed (illustrated by author)

2.2 Interview

#01

" It could be better if there is a balcony in my room".



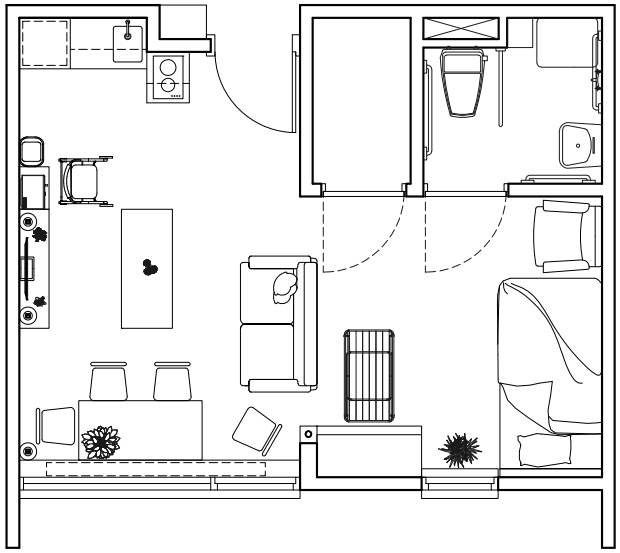


Figure 2.20 Floor plan of the room #01 (illustrated by author)

Mr. R is 61 years old and has lived at 't Nieuwe Kampje for one and a half years. His mother also lives in this building with 24/7 healthcare service. He visits her every day.

He is delighted with life here because he likes to meet people. Living at 't Kampje gives many opportunities to do so. He applied cleaning service, so someone comes to clean his room three times a week. In terms of meals, although there is a meal service, he still prepares as much as possible.

He drives to Utrecht once a week to hang out with his friends. Besides visiting friends weekly, he is also keen on playing pool ball. During the interview, it is obvious how proud he is of his reward cups on the shelf (Figure 2.21). When the conversation came to pool ball, he became excited and showed his cue stick.

About the room, he is overall happy with the size, but he said it would be even better if there was a balcony. Sometimes, he wants to sit under the sun and does not want to go outside. Besides, he could dry his clothes outside if he has a balcony. When the visit, the clothes were dried inside the room (Figure 2.21).

Figure 2.21 Photos of the room #01 (illustrated by author)

#02

" I am happy with the freedom of decorating my room".

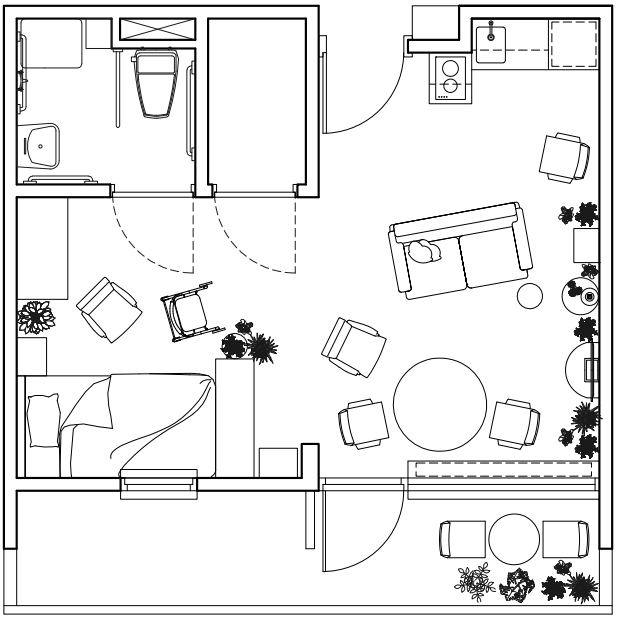


Figure 2.22 Floor plan of the room #02 (illustrated by author)

Mrs. B is 78 years old and moved in here two years ago. She has minor dementia, so she has to wear a GPS tracker. She loves plants and flowers. There are many potted plants and exquisite chinas in her room. She said the most favorite furniture is the single armchair the previous tenant left because of its proper height and armrest. There is a balcony outside her room. She goes there every day to water her plants which is her favorite routine.

Her furniture is all from her previous house. As a result of the freedom to decorate her room with her own furniture, she felt at home as usual in the farmhouse. She thought the size of the room currently was good enough. However, drying clothes are still placed in the bathroom rather than on the balcony. She only cooks by herself sometimes, so she orders the food from the service and sometimes goes to the shared dining room to have meals with other residents.

Figure 2.23 Photos of the room #01 (illustrated by author)

#03

" That threshold make me difficult to go to the yard. I cannot cross it with my rollater".

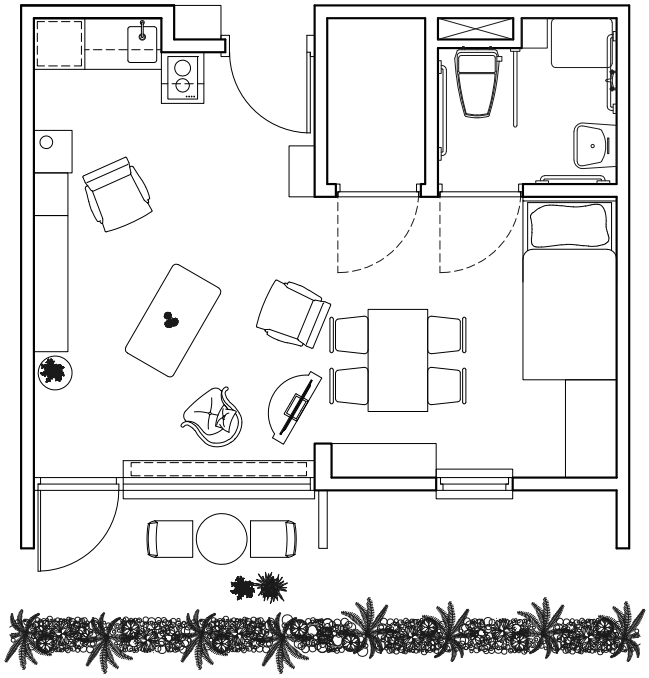


Figure 2.24 Floor plan of the room #03 (illustrated by author)

Mrs. F is 75 years old and has moved in for one year. Her room is on the ground floor with a big front yard. However, she barely uses it because of the threshold (Figure 2.24). Instead, she only uses it when her daughter comes to visit her. When visiting her room, the author asked her consent to look at her refrigerator and found another habit: drinking wine.

There is only a little decoration as regards her room compared to previous residents with whom the author talked. The author found some devices and tools not discovered in previous residents' rooms in her room. For example, a reacher grabber is a tool that helps people grab something dropped on the floor without bending their bodies.

Her mobility is weak, so she has a caregiver to assist in showering. In addition, the handle is installed beside the bed, which can help her to get out of bed.

Figure 2.25 Photos of the room #03 (illustrated by author)

#04

" This place is good because you know there is always someone there and that makes me feel safe".

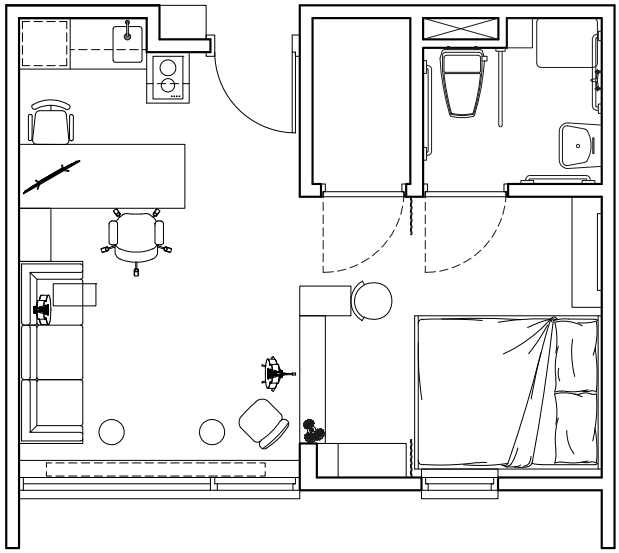


Figure 2.26 Floor plan of the room #04 (illustrated by author)

Mrs. M is 69 years old and has lived here for three years. She almost goes out every day for various hobbies. Playing guitar is her favorite leisure activity. She is also very proud that she has a guitar practice group with some residents and caregivers who work there. They sometimes go to the communal dining room to practice guitar and sing. At the last night in Loenen, the author also had an opportunity to join their practice session.

She prepares simple meals such as sandwiches in her room, but she also uses the communal kitchen often if she wants to cook a proper meal or invites her friend to have dinner together. She like living here because living here is convenient and safe. She said that you know there is always someone there 24/7. Moreover, there is a Jumbo just 5 minutes walking distance. She enjoys life at 't Nieuwe Kampje.

Figure 2.27 Photos of the room #04 (illustrated by author)

#05

Respondents : authors' parents
Location : Zoom
Date : 9th of December, 2022

The author's parents have been living with and caring for their mother (in-law) for 15 Years. They have provided various care adjusting to different stages of aging of their mother (in-law). The interview was mainly in chat format, and the language used was Chinese, with some care-space-related questions asked by the author. The following are translated excerpts from the interviews, focusing on caregiving and the use of space.

Question 1: Why did Grandma move in with us?
Your grandmother was healthy and lived alone in the countryside. However, she could not continue living on her own because of brain disorders caused by the lack of proper care after her waist surgery. She was having hearing and vision hallucinations and could not live independently. So, we brought her to our home.

Question 2: What kind of care do you provide?
When it was severe, your mother and we could not take care of her because we had to go to work in the morning, so we took her to the hospital at the beginning of her serious condition and then went to stay with her after work.

After staying in the hospital for a while, her mental problems improved with medication. However, her mobility was impacted by the medicine. But her mobility was normal while she was not on medication, and she had no problem with stairs. After she left the hospital, she lived in a guest room on the second floor. She was still relatively healthy and could take care of herself at this stage.

Once she tripped and fell in your uncle's house, she became more difficult to move after the injury, so I transformed a part of the dining room on the ground floor into her bedroom, technically just putting a bed there. (Figure 2.28) She had surgery after the injury. The doctor advised that we should take her outside for sunlight and walking. It was said to be good for the muscles and bones of the elderly. Also, because mobility became difficult, your mother began to help her with bathing, and I helped prepare meals for her.

Question 3: What is the most challenging part of caregiving?
Dad: I think it's hardest to give older people something to do because, you know, they need to exercise in order to stay healthy, but you can hardly think of activities to do when you are caring for them.

Mom: I feel that when she is bedridden for a long time after surgery, it is necessary to change the medication frequently; you know, if the elderly have bedsores, it will be very troublesome.

Question 4: What is the space in the home that could be improved and enhance the efficiency and quality of care?
Dad: I think there should be plenty of sunlight inside, ideally in the morning and afternoon, and there should be a courtyard or a safe outdoor space for her to walk around or relax, as our front yard is too small, and it is too dangerous to go out to the main road.

Mom: Because I help your grandma bathe, the bathroom is without ventilation, and I cannot open the door, so it is sweaty every time I come out. The bathroom should have good ventilation, but the elderly should not get cold.

Question 5: Why did you not choose a daycare center or nursing home in the beginning?
Your grandma refused, and I thought it was not a good idea either. I visited several daycare centers then, but the environment was not very friendly. Lately, there are some better day centers in Taiwan, but we are familiar with the care, and we take turns with your uncle every month, so we are not considering it for now.

(Note: Author's grandmother passed away in March, 2023)

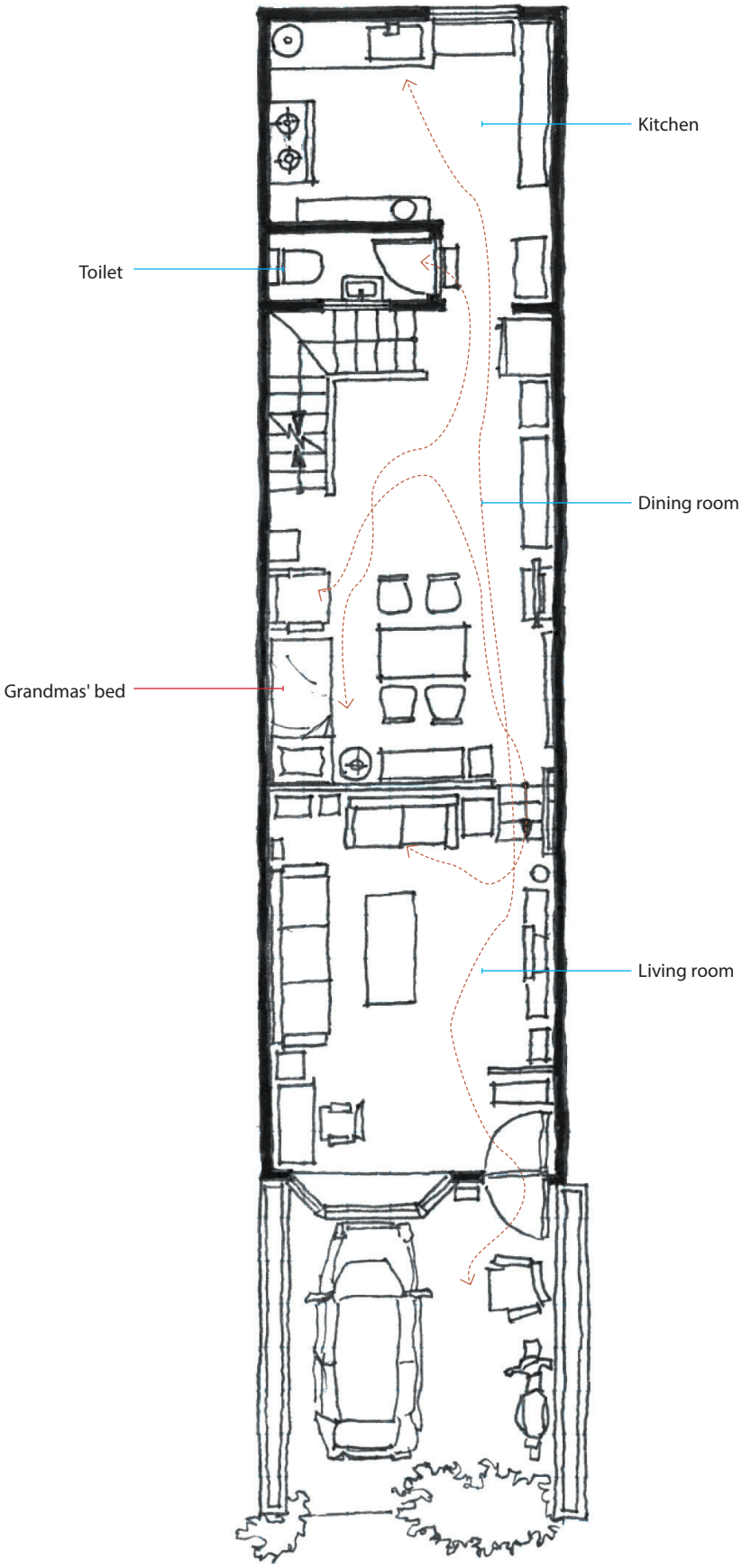


Figure 2.28 Ground floor plan of the house (illustrated by author)

#06

Respondents : Mr. Wan
Location : Zoom
Date : 9th of December, 2022

Mr. Wan was caring for his grandma for one year in the Taiwanese traditional townhouse, with steep stairs and multiple thresholds (Figure 2.30) The family replaced the living room on the ground floor as grandmother's bedroom, and since there were too many obstacles to access the toilet, grandmother had to use the bedside commode in the living room, without any privacy. The narrow space of the town house made the space dark and the high threshold made it impossible to walk safely around the home, causing his grandmother's health worsened and eventually resulted in numerous rounds in and out of the hospital. Mr. Wan shares the process of caregiving and spatial design issues in his home. The following excerpts show how obstacles in the space affect health and the spatial issues he discovered while caring for his grandmother in the hospital.

Question 1: Can you describe the space in your home?
Basically, it's a traditional three-story house with two families living beside each other. On the ground floor is a store space, a living room,a kitchen, a toilet, a bathroom, and a shared courtyard connecting to the backyard. The feature of this house is two families share the same staircase. (Figure 2.30)

Question 2: Were you the only one taking care of her at that time?
No, I did not. My aunt was doing the rest of the care. I just companied my grandma and helped her run errands, and take her for a walk.

Question 3: What is something that you think can be improved and increase the efficiency and quality of care in your home?
The threshold in this home is a problem. Moreover, the living room is too small. Since its location, everyone will pass through this space, so my grandmother cannot relax with personal privacy. In addition to the steepness of the staircase, the material is too slippery, and I have fallen several times.

Question 4: What kind of care did you provide when your grandma was in the hospital?
I went to the hospital every day after work. I talked with her and took her for a walk, but I found that the hospital corridor was not suitable for walking because of the dead end; the straight corridor made me feel weird. So it would be better if there were no end to the corridor when walking around.

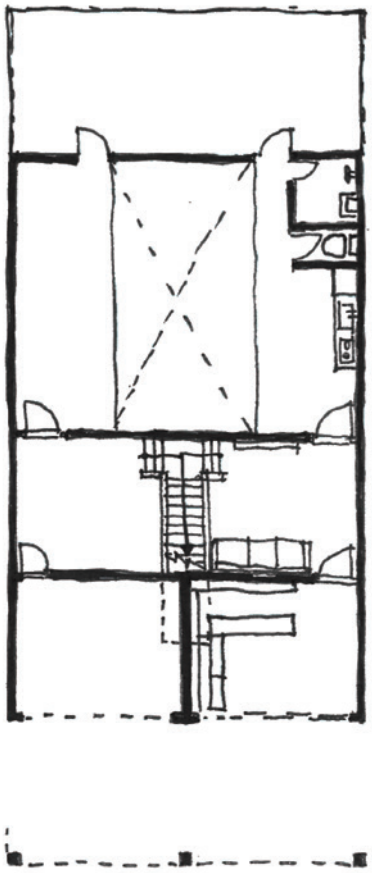


Figure 2.29 Ground floor plan of Mr. Wan's house (screenshot by author)

2.3 Findings

From the fieldwork and interviews, a preliminary understanding of older adults living space, behaviors, and needs was gained, as well as perceptions of the caregiver role from interviews with family and friends. This section organizes these observations and notes into reference information and categorizes them into two themes: older adults and caregivers.

Older adults
1. are very sensitive to the temperature of the environment, so it is important to control the temperature of the space
2. are afraid of falling, so they often walk with their heads down and pay attention to whether there are obstacles under their feet
3. cannot walk too far, het Kampje to Jumbo is only 400 meters away, but it is much work for them
4. most of them like to stay in the library lobby, I guess because they can meet people to talk to
5. need an armchair when standing up
6. walkers are their second pair of feet
7. they need a little guidance to feel needed
8. key hangers and cell phones are placed in the most prominent places of the walker
9. handkerchiefs and toilet paper are necessary items
10. thresholds can obstruct walking and increase the risk of falls
11. need a balcony

Caregivers
1. want a patio at home so seniors can safely go outside in the sun
2. day care centers can reduce caregiving work a bit
3. Toilets and bathrooms should be close to the bed
4. the bathroom should be ventilated without letting the elderly catch cold
5. seniors with reduced mobility will be less inclined to take the initiative to exercise and need to be encouraged to do so
6. more sunlight can increase the speed of recovery after surgery
7. Indoor lighting is important
8. Indoor walking space is best designed with a circular route.

Chapter 3

Target group in Sandwich Generation and their Quality of life

3.1 Family caregiver: adult children

This chapter discusses the nature of two target groups in the Sandwich Generation and the factors that influence the quality of life in relation to care, divided into two themes: adult children as family caregivers and the elderly as care receivers. The aim is to answer the sub-research questions: (1)What kind of care do adult children give to their parents? (2)What factors influence the quality of life of adults and their aging parents in terms of caregiving?

Who are the family caregivers of the elderly?

In the SCP (The Netherlands Institute for Social Research) report, parents of adults aged 45 to 64 are more likely to need help and care. Besides, about 45% of informal caregivers care for their parents (36%) or parents-in-law (10%), and the majority are women. Given the statistics in the Netherlands, most informal caregivers caring for their parents are not full-time caregivers. Informal caregivers lived with or near their parents, mainly within a half hour of their home, but one in ten adult children lived more than one hour away. Those with a partner are more likely to live with and care for their parents or parents-in-law (Boer et al., 2020).

What kind of care do they provide?

The care given by family caregivers is informal care. Informal care is defined in the 2020 Policy Report on informal care as unpaid care provided by someone acquainted with the care recipient, usually unregistered nonprofessionals belonging to the community-based care system (Boer et al., 2015). Under the context of Dutch society, informal care work is mainly instrumental care, with a small number of people providing personal care.

A study by Roe et al. (2001) described personal care as supporting individuals with daily activities such as hygiene, bathing, dressing, toileting, mobility, and feeding. This type of care is classified into eight categories based on the Instrumental Activities of Daily Living Scale assessment form made by Lawton & Brody (1969); the category is as follows:

A. Ability to Use Telephone
B. Shopping
C. Food Preparation
D. Housekeeping
E. Laundry
F. Mode of Transportation
G. Responsibility for Own Medications
H. Ability to Handle Finances

In the Netherlands, informal caregivers vary in type and dimension, from the young (18 years old) to the elderly (75 years old), among friends, neighbors, and relatives, with full-time care and occasionally giving care. However, only 43% of informal caregivers (including partners, children, and parents) are full-time core caregivers, implying intensive caregiving. Moreover, a relatively high percentage of adult children provide informal care for their parents combined with their paid job, that is, working and caring for their parents simultaneously. (Boer et al., 2015)

People give various levels of help, from practical support such as transportation (52%), visiting the doctor (46%), and administrative support (32%), to more care-related tasks such as personal care (10%), accompanying or emotional support (80%). Regarding personal care, such as assistance with bathing and toileting, this is usually carried out by professionals and is included in the health insurance act. However, as mentioned above, there are 10% of informal caregivers still provide this assistance (Boer et al., 2015).

What is Quality of life (QoL) to informal caregivers?

a.Measurement

The findings indicated that the caregiver's QoL is mainly influenced by how caregivers perceive the care receiver's QoL (Canam & Acorn, 1999). Concerning the quality of life, Canam & Acorn divides it into objective quality of life and the subjective quality of life. Measurements of objective quality of life are related to tangible material and biological elements of a person, including income, housing, physical functioning, job, socioeconomic status, and support for interpersonal networks. In contrast, subjective quality of life measures emphasizes personal feelings, such as life satisfaction, attitude, perceptions, desires, and frustrations. However, the attributes of quality of life for caregivers can be interpreted differently; for example, Padilla et al. (1992) classified the quality of life for caregivers as

1. mental health (satisfaction with life, the meaningfulness of life, goal attainment, and well-being);
2. physical health (activities of daily living, appetite, and sleep);
3. social and interpersonal health

In addition, well-being, burden, stress, socialization, domestic life, anxiety, depression, and health were considered factors influencing caregivers' quality of life (Chappell & Reid, 2002; Jones & Peters,1992).

b.Factors

Regarding the psychological factor, caregivers had a higher percentage of depression and higher stress levels, and lower scores of perceived well-being, which correlated with the time and amount of care needed, age, relationship with the cared-for person, behavior, and cognitive and functional impairment (Schulz & Sherwood, 2008). Another study pointed out that role transition of family caregivers without warning, lack of knowledge of caregiving, and frustration and burden of not meeting the needs of the cared-for person contribute to the decline in quality of life.

The physical factor is related to the physical condition of the caregiver. For example, when the care recipient's mobility decreases, functional independence often increases, making it more challenging to carry out basic activities of daily life. Consequently, they must rely on their caregivers to assist with bathing, dressing, feeding, and shifting. When these tasks are overloaded, they can cause physical injuries to the caregiver, such as back pain, muscle strains, and sprains, leading to poor quality of life.

The social networks factor is related to the narrowing social networks because of the long hours of care, fatigue of caring, and lack of leisure activities, limiting social life. Furthermore, some people may leave their jobs for caregiving reasons, thereby causing the network to shrink and making the connections to social resources less available. Changes in family life patterns, the relationship between family members who live together, and different concepts of responsibility of care may lead to low quality of life.

3.2 Care recipient: the elderly

As mentioned in section 3.1, health and dependency among the elderly are related to the caregiver's quality of life; therefore, the research in the aging phase focused on the discussion of health aspects.

Stage of aging based on the health condition

According to the World Health Organization, aging leads to a loss of physical and mental capacity and an increased risk of disease. The changes in the aging process are multidimensional and not uniform for everyone. This subsection uses the five stages of care developed by Dr. Mark Frankel to discuss the classification of aging stages based on dependency and health (Mark, n.d.).

Stage 1. Independence

Seniors in this phase can manage their daily living tasks, such as transportation, finances, healthcare , and household chores. However, at this period in their lives, people face various significant changes, from the social aspect, such as retirement, adult children leaving home, and loss of parents. Physiologically, due to hormonal effects, it causes fluctuations in mood and sleeping problems; as a result, emotional support and the company of their families are what they need most at this stage. The quality of life during this period is higher than at other stages of aging because of the ability to be independent and have control of the body. As recommended by experts, this is also the time to start preparing for future aging, such as adopting a healthy diet, increasing mental activities, regular physical examinations, and improving the home environment (Höpflinger, 2008; Bellport, n.d.).

Stage 2. Interdependence

By the time people reach this stage, there is a significant decline in health and mobility. They can still manage their lives independently, but changes in their biological functions include hearing and vision loss, slower mobility, and chronic illness. These changes can be physically limiting for older adults and psychologically impacting their health. Compared to the previous stage, this stage is more complicated for them, so family support and care are critical. Because of fragile old age, a barrier-free living environment becomes essential (Bellport, n.d.; Mark, n.d.).

Stage 3. Supporting living

In contrast to Stage 2, the elderly suffer from more physical impairment, chronic pain, and limitations, resulting in fewer tasks they can perform independently. Therefore, the elderly in this stage require more assistance in their daily lives, such as preparing meals, bathing, and dressing. In addition, at this time, family members are more involved in care than in the previous stage, and some begin to seek the services of home care professionals (Höpflinger, 2008; Bellport, n.d.).

Stage 4. Crisis management

At this stage of life, the elderly need more time and types of assistance, so family members have to invest more money, time, and energy in care (Mark, n.d.).

Stage 5. Dependence

In this final stage, seniors need 24/7 medical care and can no longer take care of themselves. For most informal caregivers, care needs may no longer be met by family members, so many people at this stage choose to either employ a 24/7 caregiver to their home or transfer the elderly to a nursing facility (Höpflinger, 2008; Bellport, n.d.).

What is Quality of life (QoL) for the elderly?

There are many ways of explaining and measuring the quality of life in old age. For example, Ann Bowling's study of quality of life in older adults found that health, home, and neighborhood are the most frequently reported factors affecting the quality of life. According to the Rondón & Ramírez (2018) study, the quality of life of the elderly is related to health, social integration, leisure activities, physical function, and environment. Netuveli & Blane (2008) refer to social contact, dependence, health, physical environment, and social comparison as indicators of the quality of life of the elderly. In this section, Health, Home and Environment, and Socialization are the most frequently discussed topics that affect the quality of life of the elderly.

a.Health

There are two parts of health: mental and physical health. Physical limitations are the most critical factor in the elder's quality of life. When seniors cannot control their behavioral abilities or perform daily activities, this leads to a lack of freedom to go out and participate in leisure activities, resulting in a smaller network, fewer social contacts, and ultimately a feeling of isolation. The psychological aspect of quality of life also changes in interpersonal relationships due to declining health and the need to rely on family or friends for help (Netuveli & Blane, 2008; Rondón & Ramírez, 2018).

b.Home and Environment

Research by Daatland & Hansen(2007) indicates that one-third of older adults state that they need to modify or renovate their homes to avoid mobility impairment or irreversible physical injury. Furthermore, the size of the house and possession of the shower and toilet contribute to the quality of life. The Lawton study noted that the accessibility of public areas was directly related to autonomy and well-being. For instance, many seniors believe that the proximity of amenities significantly impacts well-being, with places like stores, cafes, transportation, restaurants, and green spaces considered closer to home.

c.Socialization

Brinkhof et al. (2021) showed that community-dwelling elders have a better quality of life. Moreover, as also described by Netuveli & Blane (2008), when the elderly have good social relationships with family and friends, and neighbors, it also increases the sense of fulfillment and expectation in life.

Chapter 4
Spaces for care and aging

4.1 The home

Following the previous chapter on the factors influencing the quality of life, this chapter discusses the possibilities of optimizing the quality of life of caregivers and care recipients in terms of the built environment and how to enhance the quality of life of caregivers and older adults from a prevention aspect and a neighborhood relationship. The aim is to obtain these two target groups' living environment requirements and program needs and eventually answer the research questions: What spatial requirements are needed for care and adaptation to different stages of aging?

Optimizing care quality by assistive aid

As mentioned in Chapter 3.1, personal care in caregiving is a leading cause of physical injury to caregivers. Multiple studies have reported that caregivers performing personal care such as lifting, transferring, positioning, or sliding patients without any assistive aid are high-risk tasks that are the most common cause of injury to caregivers (Brown & Mulley, 1997; Wipfli et al., 2012; Craven et al., 2012). The weight of the care recipient usually exceeds the maximum weight that can be manually handled by a care professional: 35 lbs (Waters, 2007). Injuries to caregivers while providing care without assistive devices result in physical injury and decreased quality of life. They also indirectly impact the quality of care for the care recipient if they continue to work in pain and discomfort. Cohen et al. (2010) suggest that using assistive lifting devices to replace manual lifting effectively reduces the risk of injury to caregivers, improves the overall quality of care, and makes caregiving safer. Also, it facilitates the care recipient's mobility, reduces the risk of injury associated with manual lifting, alleviates anxiety and guilt related to being moved manually, and contributes to dignity and autonomy.

a. Space for care and equipments

The benefits of assistive devices are well documented; however, current residential designs have less consideration of the space to install or operate the devices, which either impedes the need to use the devices or, even if the devices are installed, makes the entire home look like a healthcare facility because of the lack of prior consideration of the integration with the architectural aesthetics. For example, there are two types of lifting devices: ground lifting and ceiling lifting; Both require adequate space for operation, especially the ground one. However, the space design often overlooks the space required for these devices by budget or by a designer unfamiliar with healthcare. For instance, considering only the space for the care recipient to turn around, without considering the operating space the caregiver needs, may result in an awkward and uncomfortable posture to care for the elderly in a cramped bathroom. It leads to injuries (Pettersson et al., 2021). Eventually, caregivers may suffer injuries from poor posture (Pettersson et al., 2021). It is also possible that the caregiver may have to move furniture frequently because of inadequate space in the room, increasing the workload and causing strain-related injuries (Cohen et al., 2010). For this reason, the findings of Hignett et al. (2008) recommend a minimum bed space width of 3.6 meters. In addition to considering operating space, storage space for assistive devices is also significant. Where storage space is limited, these unused aids are forced to be placed in visible places, making the residential environment resemble a healthcare institution (Pettersson et al., 2021; Cohen et al., 2010); for example, in the het Kampje, large lifting aids are found in the corridor, making the corridor a healthcare space look occupied by the equipment (Figure 4.1).

Figure 4.1 Assistive lifting at the corridor in het Kampje (illustrated by author)

Apart from the operating space and storage space, the floor material, the size and direction of door openings, and the threshold in the space also affect the caregiver's work. For example, when a caregiver moves a device through a doorway with inadequate width, it may cause scraped knuckles and abrasions on the upper arms. Alternatively, they may choose to move the device manually because they cannot get it into the room, increasing the risk of injury. In addition, the opening direction of the bathroom may also affect the care work. For example, when the elderly faint or fall in the bathroom, the inward opening of the door will obstruct the rescue. The door threshold must also be even with the adjacent floor surface to allow equipment to roll and prevent injury if the caregiver and care recipient trip and fall. Similarly, to facilitate the movement of large floor equipment or to reduce the resistance of wheelchairs, carpeting that increases the difficulty of rolling should be avoided, even though it may cushion the impact of a fall and reduce the transmission of sound(Cohen et al., 2010).

Among the assistive lifting aid, a ceiling lift is considered the most preferred choice (Alamgir et al., 2009; Cohen et al., 2010). With the ceiling lift, more space is available for care work because the room has to accommodate assistance devices for the elderly, such as walkers and wheelchairs, besides the lifting aid (Pettersson et al., 2021). The rail for the ceiling lifting can be installed on the ceiling and wall. In order to design the space for a convenient installation of assistive devices in the future, the architectural design should include the structure to ensure that the weight or support brackets are strong enough to sustain the installation of the devices. Moreover, pre-planning assistive devices' location makes it easier to merge spatial aesthetics with the devices. For example, the ceiling lifting rails are embedded in the ceiling so that the assistive devices integrate with the finishes, making the room more like a home rather than an institution (Cohen et al., 2010). The above examples show how the space's size, the flooring's texture, the doors' installation, and the building's structural system are inextricably linked to the assistive devices and care work.

b. Configuration for care

In addition to the space required for assistive devices, room arrangement plays a crucial role in the quality of care and in maintaining the care recipient's independence. When the elderly are less mobile with aging, the proximity and configuration of rooms are critical. In Petterson et al.'s (2021) study findings, the spatial configuration was discussed in three categories: toilets and rooms, entrances and rooms, and open layouts. First of all, caregivers believe that bathrooms, bedrooms, and living rooms should be adjacent to each other, especially bathrooms and bedrooms, because these are the spaces where seniors frequently spend time and need assistance. When the bathroom and bedroom are separated far from each other, seniors with frail mobility might be less likely to go to the bathroom or become diaper dependent, as well as the longer the distance between the two spaces, the heavier the caregiver's workload will be, which makes them more likely to experience injuries and fatigue problems. Secondly, the entrance should connect directly to the toilet and bedroom. This way can avoid the caregiver traveling through the care recipient's other living space and reduce the disturbance of the caregiver's family and friends while maintaining the privacy of the living space. Finally, the opening layout of the home is ideal for caregiving, with fewer walls blocking the space and providing a clear view of the space. In addition to making it easier for caregivers to observe the condition of the elderly, it is also better for the elderly to move around and find toilets or things they need.

c. Other spatial considerations for care

Other than the consideration, as mentioned earlier, of equipment space and space layout, many factors still affect the quality of care due to the architectural space and the details of the building equipment. For example, poor lighting makes care more difficult. Large windows can introduce more natural light, which benefits the caregiver and positively impacts both physical and psychological well-being while compensating for the lack of artificial light. Furthermore, reducing sound transmission and interference can improve sleep quality and provide caregivers with relaxation opportunities. Moreover, ventilation is essential in handling unexpected situations, such as the elderly incontinence dingy room. Good ventilation can help alleviate the odor (Soilemezi et al., 2017).

Finally, concerning the obstacles to caregiving due to the placement of electrical equipment in the building, caregiving requires different equipment depending on the stage of aging, and most of the assistive devices have electrical needs; however, caregivers interviewed in the study mentioned that there were not enough electric outlets, which led them to install extension cords to solve the use of the assistive devices themselves. This type of compensation could easily lead to the possibility of tripping over the user (Cohen et al., 2010).

Maintaining the independence of the elderly

According to the discussion of factors influencing the quality of life in Chapter 3, mobility is an essential indicator for both older adults and caregivers. When seniors can maintain their mobility, they have more ability to control their lives. They can do more daily activities independently without relying too much on personal care services, such as bathing and toileting. Moreover, by maintaining their independence, their caregivers' work is relieved, and the risk of physical injury decreases; thus, maintaining the mobility of seniors is a win-win situation for both seniors and caregivers. In addition, preventing mobility impairment can also slow institutionalization and achieve the ideal of aging in place. That means understanding the factors contributing to mobility is critical to improving caregivers' and seniors' quality of life.

a. Barriers to maintaining mobility of the elderly: Fall-related accidents

Falls are a significant driver of immobility in the elderly (Verbeek et al., 2022). However, the consequences of falling in the elderly differ from those in the younger age group. The recovery speed after a fall is relatively slow, depending on the physical condition. Moreover, there may be more severe consequences, such as fractures in the elderly with osteoporosis and possibly fatalities (Michael, 2004). The 2018 statistics from CBS show that the number of deaths due to falls is increasing in the Netherlands, mainly among the elderly. In order to prevent the rise of falls among the elderly in recent years, the Dutch government has supported healthcare-related groups to offer courses: Vallen Verleden Tijd, which teaches the elderly how to avoid falls and fall properly with health insurance coverage (Schuetze, 2018).

b. Reasons of falling: individual health condition and living environment

Many factors may contribute to falls in the elderly, from personal physiological factors: history of falls, visual deterioration, impaired balance, loss of muscle strength, slow response time, physical illness, cognitive impairment, medication, and improper use of mobility aids (Michael, 2004). In terms of the living environment, it is related to the accessibility and safety of the space in the home. From the discussion in Chapter 3.2, the home space in the living environment is crucial for the elderly as they spend more time at home than any other age group (Brasche & Bischof, 2005). As a result, when the original home space cannot meet the aging stages' needs, it can encourage seniors to move, modify their homes, or choose to enter a nursing home. According to Carnemolla & Bridge (2019), housing modifications can reduce dependence on the need for care, particularly informal care. However, home modifications are expensive, time-consuming, and may not completely meet residents' accessibility requirements owing to the space limitations of the original space. Furthermore, the home may look like a hospital due to the after-the-fact addition of compensatory measures (Wellecke, 2022). Hence, it is preferable to integrate the need for accessible space and the space for future care needs for aging into the new housing design (Wellecke, 2022).

Prevention as a priority: Accessibility and safety

This paragraph continues the previous discussion, from the perspective of accessibility and safety, to explore preventing falls from the home environment. The topics compress three categories as follows: (1) floor height difference and its material, (2) distance of room to the toilet, (3) lighting and placement of switch.

(1) floor height difference and its material

Because of aging, the muscle strength of the elderly is weak, and the foot lift height is lower compared to young people. Also, some people choose walkers or crutches to support themselves and maintain mobility. In such walking behavior, the ground height difference and material become one of the factors that cause the elderly to fall. When the interface between the flooring materials in the home is uneven, they are likely to be tripped over (Kuboshima et al., 2018). Also, thresholds and

steps are the main obstacles to mobility for older adults with walkers (or wheelchairs) and those using crutches (Wellecke, 2022). This factor is evidenced in the field survey, where resident Mrs. F. reported that she could not reach the outdoor garden from the living room because the threshold was too high for her walker to move, limiting her garden use. Apart from height differences, floor material is a common contributor to falls. As mentioned in Space for Care in paragraph 4.1.1, carpeting can influence the operation of ground assistive devices, as well as for wheelchair users or older adults with mobility aids. The carpet will affect the wheel's sliding and affect their walking.

(2) Distance of room to the toilet
Going to the bathroom becomes problematic for the elderly because of aging body organs or other pathological reasons. Incontinence is one of the most prevalent problems because of the inability to control the correct timing of going to the toilet. Therefore, accessibility and distance to the toilet are critical for the elderly. Based on a study by Kuboshima et al.(2018), one of the respondents tried to go to the toilet 3 meters away but was unable to reach it and suffered from incontinence. Besides the psychological stress caused by incontinence, incontinence causes the ground to become slippery and cause falling. Furthermore, for seniors with dementia who have a cognitive impairment, the toilet must be in an easily identifiable place. If too many obstacles in space block their vision, they may be unable to find the toilet, leading to incontinence as they miss time.

(3) Lighting and placement of switches
Adequate indoor ambient lighting can contribute to healthy aging (Eilertsen et al., 2016). The quality of lighting improves the quality of life and can improve visual, physical, and mental health, as well as enhance the ability of older adults to perform daily activities (Falkenberg et al., 2019). However, when the indoor lighting is insufficient, the elderly will be unable to correctly identify the distance between things in the space, causing falls because of the degradation of vision and reduced sensitivity to light, which makes them slower to adapt to light and darkness than young people. Therefore, the lighting of the home is crucial. In addition, a study suggests that the light switch should be close to the bedside within reaching distance or use remote lighting to reduce the possibility of tripping over because of the light switch (Michael et al., 2004).

4.2 Neighbor to neighborhood

In addition to residential space, the built environment of the community and neighborhood also impacts the quality of life for caregivers and care recipients. For example, a study by Wang & Shepley (2018) indicated that older adults are more likely to take a walk in a safe walking environment. Walking not only maintains health, improves independence, and prevents premature institutionalization, but it also positively impacts mental health by providing more opportunities for social interaction in the neighborhoods. Moreover, the appropriate level of social interaction positively impacts the health, well-being, and life satisfaction of people in different age groups. For the elderly, it can alleviate feelings of loneliness; for caregivers, it can improve the feeling of social isolation caused by caregiving work, as well as the feeling of being supported and understood by interacting with people in the same situation, which further improves the quality of life in social and psychological aspects. The above literature analysis shows that when the built environment meets the needs of both the caregiver and the care recipient, it is helpful to the ideal of aging in place.

a. Mobility: Walkable and aging-friendly environment
The mobility of older adults is crucial to the quality of life and aging in place. Walking is the primary means of transportation for older adults. Studies have shown that walking helps older adults maintain their physical health and mobility and reduces the need for care services. Winters et al. (1982) propose that the elderly living in walk-friendly neighborhoods have higher mobility and are relatively willing to get out and walk in an accessible and safe environment. On the other hand, Ståhl et al. (2008) identified uneven surfaces, curbs, narrow sidewalk widths, steep slopes, step heights, and inadequate street lighting as walking barriers in the environment. Furthermore, installing benches in the environment is also a reason that prevents older adults from walking outdoors. From a study of benches, Ottoni et al. (2016) found that benches positively contribution to the walking experience of older adults: they allow them to enjoy outdoor green spaces more, serve as mobility aids, and even promote social interaction. In addition, neighbors' safety is also enhanced by the increased willingness to sit on the benches, which serves as a citizen surveillance function.

b. Activities: proximity & amenity

As seniors age, the geographic radius of involvement in daily life generally decreases, so proximity and amenities in the neighborhood are critical. Accessibility implies that seniors whose primary transportation means is walking must be able to reach their destination on foot. On the one hand, destinations that are too far away will make them less willing to go out by themselves. On the other hand, the need for and attractiveness of the amenities also affect the willingness to go out. Regarding the proximity of services and amenities to home, respondents in the Ståhl et al. (2008) study referred to: their difficulty walking more than 200m without resting. Moreover, places over 165ft (50m) from home are at the edge of the mobility range for frail and low-mobility elderly (Campbell et al., 2015). Therefore, when establishing social welfare facilities and other neighborhood amenities, it is essential to consider the proximity to homes.

The vitality of the street is a product of the diversity of the built environment, and the presence of pedestrians indicates the city's vitality (Jacobs,1992). Rosso et al. (2013) state that the diversity of facilities benefits older adults' mobility. In the literature analysis (Gabriel & Bowling, 2004; Wang & Shepley, 2018; Campbell, 2015; Wang & Lee, 2010; Winters et al., 2015) and field surveys on the needs of older adults on facilities near their homes, it can be found that seniors' needs vary by age, mobility, physical health status, and country. However, some facilities are mentioned repeatedly, as follows:

(1) shops/supermarkets
(2) pharmacy / medical services
(3)restaurants/ cafes
(4)public transportation
(5) park/ garden
(6)Library
(7) communal lounge
(8) Community center /ontmoeten
(9) post office/ bank
(10) Balcony

c. Enhancing Social interaction: the way to encounter others

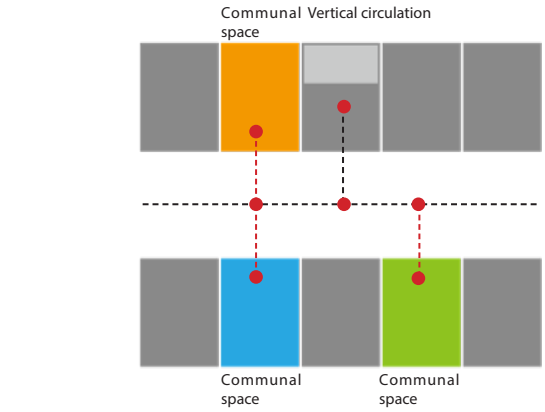
Appropriate levels of social interaction may increase the possibility of social support, which promotes health and well-being (Marmot, 2005). As mentioned in Chapter 3, the factors that affect the quality of life, both for the caregiver and the care recipient, are loneliness and social isolation affect their quality of life. Therefore, the design of the residential environment should consider how to generate more opportunities for social interaction. Many factors influence the desire to interact socially related to the individual, such as personality and mobility, as well as the physical environment, such as the density of living space, the location and quality of public space, and the climate. This paragraph discusses the residential environment and architecture in terms of where people interact with each other and how the spatial layout can increase opportunities for social interaction.

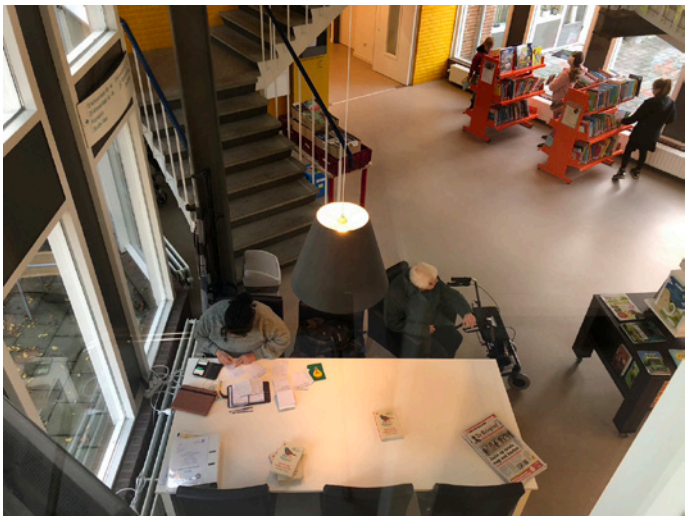
According to Bouma et al. (2015), social interactions are classified into active and passive interactions; active interactions usually occur in specific spaces with a purpose, usually in atriums, roofs, gardens, shared lounges, and parking lots in dwellings, whereas passive interactions are spontaneous encounters that often take place in hallways, elevators, stair halls, and lobbies. Furthermore, the arrangement of residential space also influences social interaction. A study by Williams (2005) was conducted with housing in row layout and cluster layout, which found that different layouts of residential space have different effects on active and passive interaction. For instance, the row layout has more passive interactions, mostly in corridors and elevators and the communal space on the path (Figure 4.2). In contrast, cluster layout has different results due to the characteristics of the common space placed. However, there are generally more active and fewer passive interactions compared to the row layout. Other than spatial layout, the visibility of the communal space also affects the frequency of social interactions. When residents cannot easily see the usage behavior of the communal space, they are less likely to use it and have fewer opportunities to interact.

Furthermore, in Danielski et al.'s (2016) study of the heated atrium in residentials, it was further found that buildings with atriums have the potential to facilitate and promote social interactions among residents and increase neighborhood relationships as well as a sense of belonging. Such a spatial strategy of a heated atrium provides comfort in winter, similar to the concept of the winter garden in the case shared by Dorte Kristensen in the lecture on February 28, 2023. (Figure 4.3) Moreover,

the lecture on February 28, 2023 (Figure 4.3). Furthermore, in the fieldwork, the authors observed that the intersection of multiple routes is the most likely to generate interactions. For example, the entrance of het Kampje's residence and the library's entrance are shared, and there are two entrances (fig.4.4). As a result, the neighborhood residents will take a shortcut through the library to save travel distance, resulting in more opportunities for neighborhood residents to meet each other.

Figure 4.3 Winter garden in project: Scheldehof Residential Care Centre (Atelier PRO architects, 2017)





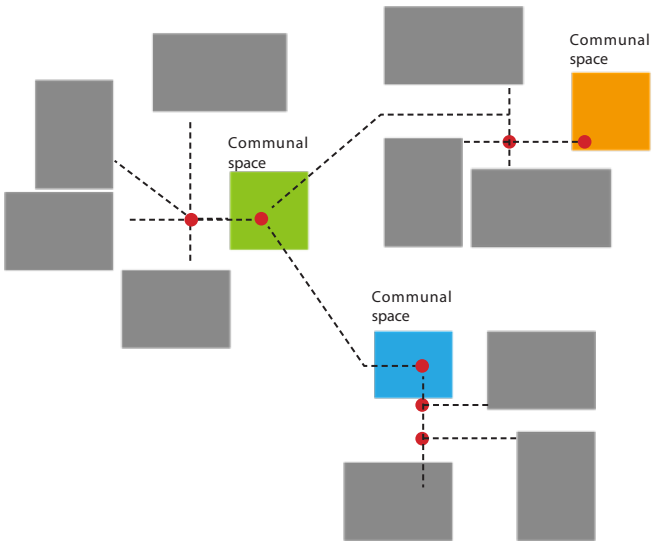


Figure 4.2 Housing with row layout and cluster layout (illustrated by author)

Figure 4.4 Lobby as the intersection of multiple routes (photo by author)

d. Mitgating burden from care duration: Senior daycare

As discussed in Chapter 3, the factors influencing caregiver quality of life are associated closely with the care recipient's health status and familiarity with caregiving. As dependency increases, the more time and physical strain the caregiver devotes, the greater the risk of injury or fatigue, which can be psychologically stressful when the caregiver is unfamiliar with the work. Studies have shown that support groups, educational training, close contact with professional caregivers, daycare services, and home-based care can positively impact older adults' quality of life and health while alleviating caregiver burden and increasing well-being. As a result, interventions related to the caregiving burden have been developed. For example, Sörensen et al. (2002) categorized interventions to improve caregiver burden into six types: psychoeducational, supportive, respite/ adult day care, psychotherapy, and interventions to improve care receiver competence.

Daatland and Hansen (2007) mention three types of measures that must be established if the elderly are to remain in their original homes longer:

- the adaptation of housing to the functional abilities of the elderly
- the provision of social services in the neighborhood (e.g., senior day care centers)
- a living environment that meets special care needs

The senior daycare centers in the aforementioned social service facilities have many levels of benefits in terms of reducing government spending on nursing homes and assisted living facilities, providing a source of community support and assistance for caregivers, supporting older adults to remain in their homes, and preventing the risk of premature institutionalization (Duncan et al., 2019; Tretteteig et al., 2017). For example, findings from a study by Zarit et al. (2011) confirmed that caregivers using adult daycare experienced a significant reduction in stress assessments compared to non-users. In addition to reducing stress by providing caregivers with time away from home, the physical, cognitive, and social stimulation provided by daycare center activities also improved care recipient behavior and sleep, thereby reducing caregiver burden.

Most daycare centers mentioned above serve seniors who depend more on care services, such as those with more severe cases of dementia. Meeting spots (Ontmoeten) are more common than daycare centers with medical care services in Dutch society (Figure 4.5). For example, the Wijkcentrum Cromvlietplein in the Laak area provides a place where seniors can socialize. The elderly chat, drink coffee, and play card games; moreover, this meeting spot serves a simple meal at lunchtime. A conversation with one of the elderly women from Suriname revealed that she comes here four days a week. The community supports the meeting space and says that more such community centers should be established. In addition to providing services to seniors, this community center occasionally organizes training courses on caregiving. Furthermore, it allows caregivers to meet and interact with each other.

Figure 4.5 Flyer of Haggs Ontmoeten

Note. The image is from the website https://haagsontmoeten.nl/

4.3 Design guideline

According to the sub-research questions in this chapter: What spatial requirements are needed for care and adaptation to different stages of aging? The themes of the design guideline are divided into the space inside the home, the public space outside the home, the neighborhood environment, and the amenities and facilities.

Space inside the home

1. The most preferred option is ceiling-mounted aids.
2. For the future installation of ceiling lifting, the weight of the building structure should be considered.
3. Ceiling height should also be considered to allow space for the installation of rails.
4. Storage space is necessary to accommodate care equipment and daily necessities
5. The room should consider not only the turning radius of the wheelchair user but also the operating space of the flooring line to transport the auxiliary equipment
6. The bathroom size should consider the situation when more than two people (an older adult may have two caregivers) are in there at the same time.
7. The smallest width of the bedroom size is 3.6 meters
8. The material of the floor should not be too smooth
9. The joints between different materials of flooring should be slippery
10. Steps or thresholds should be avoided
11. Door width should take into account the space for people and equipment to pass through
12. Bathroom doors should be open to the outside to avoid affecting the rescue of unexpected situations
13. Sliding doors are more suitable for the elderly than sliding doors
14. The bathroom should be adjacent to the bedroom and living room
13. The entrance should be directly accessible to the bathroom and the bedroom
14. The bathroom should be visible and accessible for the elderly
15. Lighting should be adequate
16. Large windows help to introduce light
17. Sound insulation and sound absorption should be considered
18. Consider the ventilation of the space
19. sufficient outlets should be provided
20. light switches should be located at the bedside and within easy reach
21. the room should be designed with the principle of an open layout, and the partition walls in the space should be reduced

Public space outside the home

1. Increase route intersection
2. Place communal spaces in a way that they are easily visible and on the paths that people usually pass
3. Create communal spaces to increase opportunities for active social interaction
4. Indoor atrium or building configuration with atrium increase opportunities for interaction

Neighborhood environment

1. Walking-friendly space is essential for the elderly
2. Uneven surface materials should be avoided
3. Pay attention to the width of the pathways
4. Steep ramp should be avoid
5. Steps should not be too high
6. Street lighting should be sufficient
7. The number and installation of benches should consider the walking habits and limits of the elderly. For example, 200 meters is the limit of no rest for the elderly
8. Designing a walking path in a natural environment with plants

Amenity and Facility

1. Shops / Supermarkets
2. Pharmacy / Medical services
3. Restaurants/ Cafes
4. Public Transportation
5. Park/ Garden
6. Library
7. Communal lounge
8. Senior Daycare
9. Community center/ Ontmoeten
10. Post office/ Bank

Chapter 5
Living together

5.1Privacy and independence of home

This chapter examines the dwelling type, the privacy of living space, and adaptability of homes for multigenerational families intending to answer the sub-research questions:
(1)What spatial requirements are needed for adaptation to different stages of aging?
(2)What kind of living arrangement can help sandwich generation families live together with privacy and independence?

Privacy is a basic human need, and the home is considered the heart of personal life, providing privacy for families and individuals. According to de Macedo et al.'s (2022) review of the literature on privacy and housing, territoriality, personal space, crowding, and solitude are relevant to housing space. Privacy does not merely have a separate room but the control of communication with others and the ownership of one's territory(Judd B., 2020). While privacy is the process that regulates the core of human spatial behavior, personal space, verbal and nonverbal behavior, and territory are the mechanisms of the physical environment used to regulate privacy (Judd B., 2020), meaning that privacy can be satisfied by the control of space and territory.

Privacy is the most frequently discussed issue in multigenerational living models (Gerards et al., 2015; Gale, 2010; Rechavi, 2009). Although families living under the same roof can reduce loneliness by keeping each other company, family members' privacy and independence inevitably affect each other. When residential spaces fail to meet the privacy and independence of each family member due to size, shared space, and acoustic insulation, family conflicts increase, resulting in lower family well-being and potentially affecting the social life of the residents (Easthope et al., 2015; Judd, 2020). Based on literature research and questionnaires, this subchapter examines how space affects the privacy and independence of living together regarding (1) the number and placement of entrances, (2)space size and crowdedness, (3)shared spaces and routine, (4) sound disturbances in residential spaces. Eventually, the principles for multigenerational apartment design will be developed.

(1) The number and placement of entrances
In multigenerational living models, separate entrances are considered preferable. (Niederhaus & Graham, 2006). A separate entrance provides independence, as respondents to the survey mentioned that having a separate entrance allows them to invite friends to their homes without being disturbed by their parents or disturbing them. In the study by Alfirević & Simonović (2019), it is mentioned that the use of a secondary entrance connected to the kitchen can accommodate different generations of family members with different lifestyles, solving not only the problem of privacy but also the conflict between generations, such as having better sleep quality and social activities. (Hwang, 1997)

(2) Space size and crowdedness
Privacy is related to the size of the housing. When there is insufficient space in a home, the physical distance between family members will be relatively short, and the chance of interference with personal space will increase. Overcrowded living conditions not only influence personal privacy but also affect health, sleep, and the overall life satisfaction of caregivers in multigenerational families. (Pruchno et al., 1993) The assessment of living space overcrowding varies depending on the size, age, relationship, and gender of the household. According to the European Union Bureau of Statistics, overcrowding occurs when a household does not have the following minimum number of rooms.
- one room per couple in the household
- one room for the household
- one room for every single person aged 18 years or more
- one room per pair of single people of the same gender between 12–17 years
- one room for every single person between 12–17 years and not included in the previous category
- one room per pair of children under 12 years

According to this description, having a room is the minimum for a family to live in without overcrowding. Therefore, to ensure privacy in a residential space, it is important not to feel crowded. The larger the space, the more rooms in the house, and the more space each person has. Moreover, family members can use the rooms flexibly without the limitation of size and number of rooms; thus, privacy can be protected with better space separation between rooms (Gale & Park, 2010). For example, in the questionnaires, although the respondents did not have a specific size requirement for the bedroom, they could still draw an idea from the functional requirements of the individual room to

determine the size of the space required. From the answers given by the respondents below, it is clear that the room size must be large enough to accommodate not only the bed but also the space for relaxation and inviting friends.

All I would need would be a sufficient room size so that I can have something like a couch to invite friends over and a separate entrance. (Dutch, Woman, 32 Years old)

For me it is essential to have a space which would be just for me, so definitely a bedroom, but if you are older and living with them it would be nice for this space to be quite large, to fit a couch etc in there as well. (Dutch, Woman, 25 Years old)

(3)Shared spaces
When multiple generations live together, there is inevitably a need for sharing spaces, and the amount of shared space is not only related to the space size as mentioned above, but also has a strong correlation with the living style and routine. The bathroom was the second most important space in the survey after the bedroom, which is absolutely private. Even though sharing a bathroom is acceptable, respondents still suggested having their own bathroom would be better. To avoid waking up the family, a separate bathroom or one close to one's bedroom is necessary because of the difference in daily routines. Compared to bedrooms and bathrooms, kitchens are the core place for common activities among family members. Once the family's routine is similar, kitchens have relatively little interference with individuals, ; however, from several studies, the way individual generations use the kitchen, their eating habits, and meal times are quite different. For example, if a family member eats dinner late, the noise in the kitchen will disturb the family member whose bedroom is near the kitchen. The living room, on the other hand, is affected by different entertainment styles, and the Gale & Park (2010) study showed that the longer older parents spent in the shared space, the more negative the daughter's husband's perceptions of the home increased. Furthermore, Some people even said that they would not invite friends over because they would feel uncomfortable at home with elders, which not only increases the caregiver's sense of isolation but also causes increased subjective burden (Pruchno et al.,1993).

(4) Sound disturbances in residential spaces
In addition to the privacy challenges in residential spaces, noise is one of the main factors affecting privacy. Noise is defined as unwanted sound. People can usually tolerate the sound they make, but it becomes noise when it is beyond their control. Noise in dwellings is mainly related to room adjacency, spatial division, surface reflectance, and sound insulation of walls and doors (Judd, 2020). When rooms in the home do not have good acoustic insulation, the sound will transmit through the walls and ceilings everywhere.

Moreover, when shared spaces such as living rooms and kitchens are too close to bedrooms, without soundproof doors and walls, family members will disturb each other because of different daily routines. Additionally, the problem of noise is usually bi-directional. If your sleep is interrupted by the sounds of your family, it also implies that people outside the room can also hear the sounds in your room. This lack of privacy due to noise problems is considered to have a negative impact on well-being. The problem of noise is even more noticeable in multigenerational living. For example, for the elderly, because of aging hearing, watching TV is always tuned particularly loud, making noise to the children or grandchildren living with them.

5.2 Multi-generational living

Typologies of living together
In the book by Niederhaus & Graham (2006), privacy and proximity were described as essential considerations for extended family households. According to these two critical attributes for multigenerational family living, the option of living together are categorized into the following housing types: accessory apartments, duplexes, townhouses next door, two apartments in the same building, family compounds, cohousing developments, houses next door, behind or across the street, and several blocks away. From these categories, the following four categories of dwelling are integrated into this study based on size, whether they are connected, whether they share a particular structure, and whether they are independent:

a. Accessory dwelling
Residents share the entrance, courtyard, and parking space. It is attached to the main residence both in size and appearance, usually not facing the

street but hidden behind the main house. Accessory houses have many names, such as granny flats, in-law apartments, and bonus units. They are considered to be the most versatile type of housing. The space is flexible enough to be used as a home, an office, a rented house, or for the caregiver of the elderly. Furthermore, this type of home allows an extended family to live together at the same time but separately and independently.

b. Duplex

Two homes share interior structures, such as a wall, a floor, and a ceiling). Two homes may have the same or different floor plan layouts but have similar amenities. Its flexibility, like accessory houses, is considered the ideal solution for family members to provide semi-regular care to independent family members. Because of its proximity, family members can share some mutual errands, making it easier for family members to visit each other.

c. Townhouse

It is usually a row house sharing a common wall that allows families to live next door. Proximity brings families closer together with individual front doors, like Duplex, providing the support they need.

d. Condominiums

The condominium is an apartment with an individual door. Families share common grounds and passageways. No matter that next door or on a different floor can have many of the same benefits as duplexes and townhouses next-door.

Spatial arrangement

According to the privacy of the spatial arrangement, it is divided into vertical and horizontal categories:

a. Vertical arrangement

In this category, the first type is housing, where people share the front door and staircase, which is very common in Asia. The families share the kitchen, living room, and dining room, but each floor has its own private bedrooms and bathrooms. Generally, the ground floor is for the elderly, as there is no risk of going up the stairs at ground level, while the adult children and grandchildren live upstairs in a shared address. The other type is a building with a shared entrance or staircase, but there is an extra door to each house, which makes the living space completely independent. Moreover, each

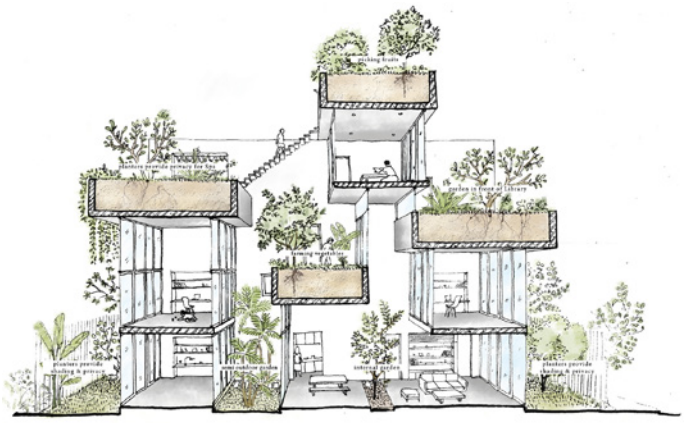


Figure 5.1 Section shows how to separate living space and keep individual privacy by vertical arrangement of rooms.

Note. The image is from the website https://www.archdaily.com/)

household has an address. Typically, the staircase connects two households, one on the ground floor and the other on the second floor, through a shared entrance, providing a living space that does not interfere with each other. Part of the Dutch walking-up apartments is this type of housing.

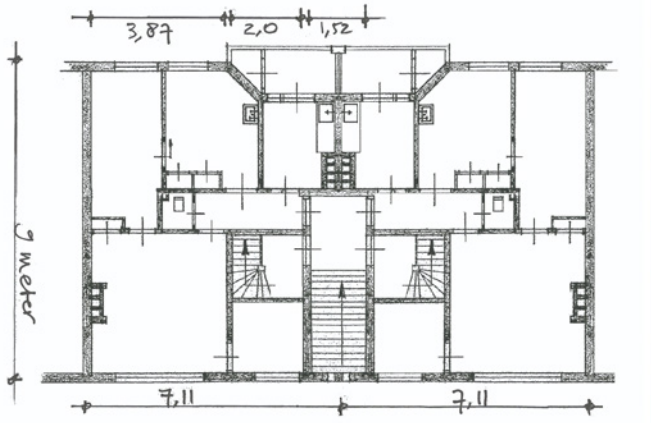


Figure 5.2 Floor plan of typical walking-up apartments in the Netherlands

Note. The image is from the website http://www.bestaandewijk.nl/)

b. Horizontal arrangement

The horizontal living style for multigenerational families is divided into two types: sharing a corridor and sharing a foyer. In the study of Judd B. (2020), several terms are commonly used for this type of apartment, such as 3Gen apartment and dual key apartment. The concept of living was developed from the granny house. Research by Hwang (1997), a professor in Taiwan, proposed to address the issue of privacy and different living habits of multigenerational families living under the same roof and finally developed a prototype apartment design specifically for three-generation families (Figure 5.3). In recent years, this type of housing has become increasingly popular in the Australian and Singaporean housing markets, tailored for three-generation families (Figure 5.4).

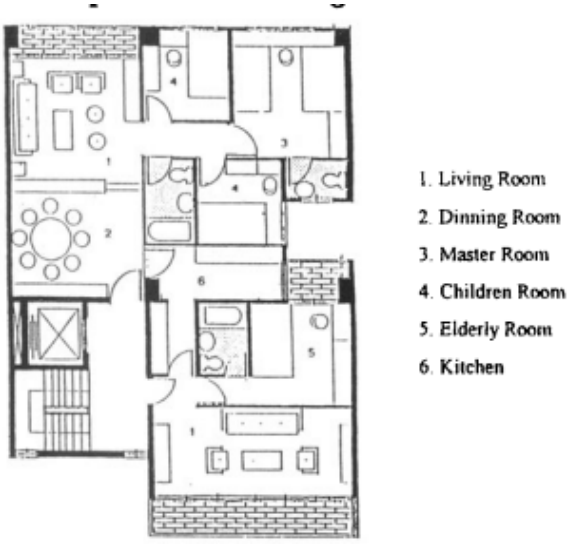


Figure 5.3 Prototype of mulit-generational housing

Note. The image is made by Hwang, Y. R. (1997). Housing for the elderly in Taiwan. Ageing International, 23(3), 133-147.

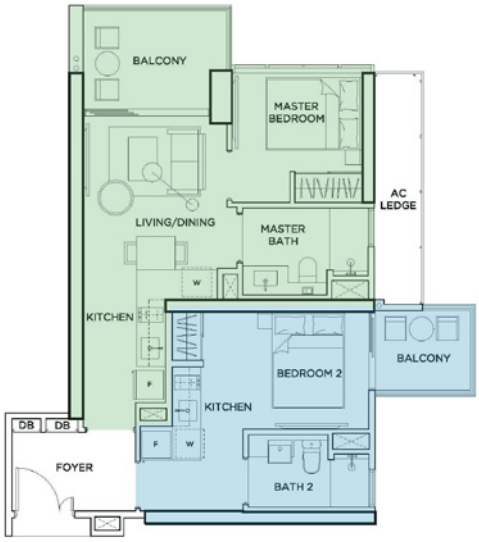


Figure 5.4 Dual key apartment

Note. The image is from the website https://stackedhomes.com/editorial/dual-key-condos-profitable/#gs.ms38fl

5.3 Home adaptivity for life course

In order to achieve the goal of aging at home, the home's adaptability is crucial. Housing adaptability positively impacts the quality of life, as it not only continues the familiarity with the living environment but also increases the sense of security, identity, and autonomy. Adaptability in this thesis is based on Till & Schneider (2007) and Braide (2019), which define the concept of residential adaptability as spaces that can be expanded and reduced according to household size, such as growing up and moving in or out. Also, it can meet the needs of family members of all ages, such as the elderly, who have declining physical performance and must consider barrier-free spaces to reduce the risk of injury. There are many methods and strategies to achieve adaptability in housing. This study examines the use of adaptability in architectural space based on the three strategies proposed by Braide (2019): generality, flexibility, and elasticity.

Generality

Most residential designs today focus on specific functions for each room, ensuring that the quality of the room is appropriate to its function but limiting the possibility of using the room for other purposes. Hence, the general layout means that it does not give a room a specific function, so it can be a bedroom, a living room, or a dining room and can be flexibly interchanged to meet the needs of the occupants without physical modifications to the space. In order to achieve such generality, it is possible to achieve it through the frame structure and the arrangement of a centralized service core. For instance, in 85 Social Dwellings in Cornellà (Figure 5.5), the toilets and kitchens are controlled in the middle of each modular frame. At the same time, the rest of the space is not given a specific function so that the user can adjust the apartment's floor plan to the function and spatial combination of each room according to the size of the family and the needs within the frame.

Flexibility

Flexible spatial layouts allow for physical changes in space, such as the number and size of rooms, through movable walls and furniture. In the case of Social housing in Carabanchel (Figure 5.7), the architects propose possible spatial changes within 24 hours. During the day, occupants can store their bedroom beds in the space below the elevated shared corridor, while at night, the home can be divided into several rooms with folding partitions (Figure 5.6). This mechanism can be used for daytime, and nighttime changes, and when the number of family members changes; it can be adapted flexibly.

Elasticity

Flexible layout refers to expanding and contracting residential spaces, usually achieved by combining and separating spaces between adjacent units, with each space usually complete with the essential residential appliances. In the case of housing "Baugruppe LiSA," each of the smallest house types has complete living conditions, so there are possibilities to expand from a single house to a double or even a three-generation house (Figure 5.8).

Figure 5.8 Elasticity in housing
("Baugruppe LiSA" by WUP architecktur, 2015)
Note. The image is from the website of WUP architecktur

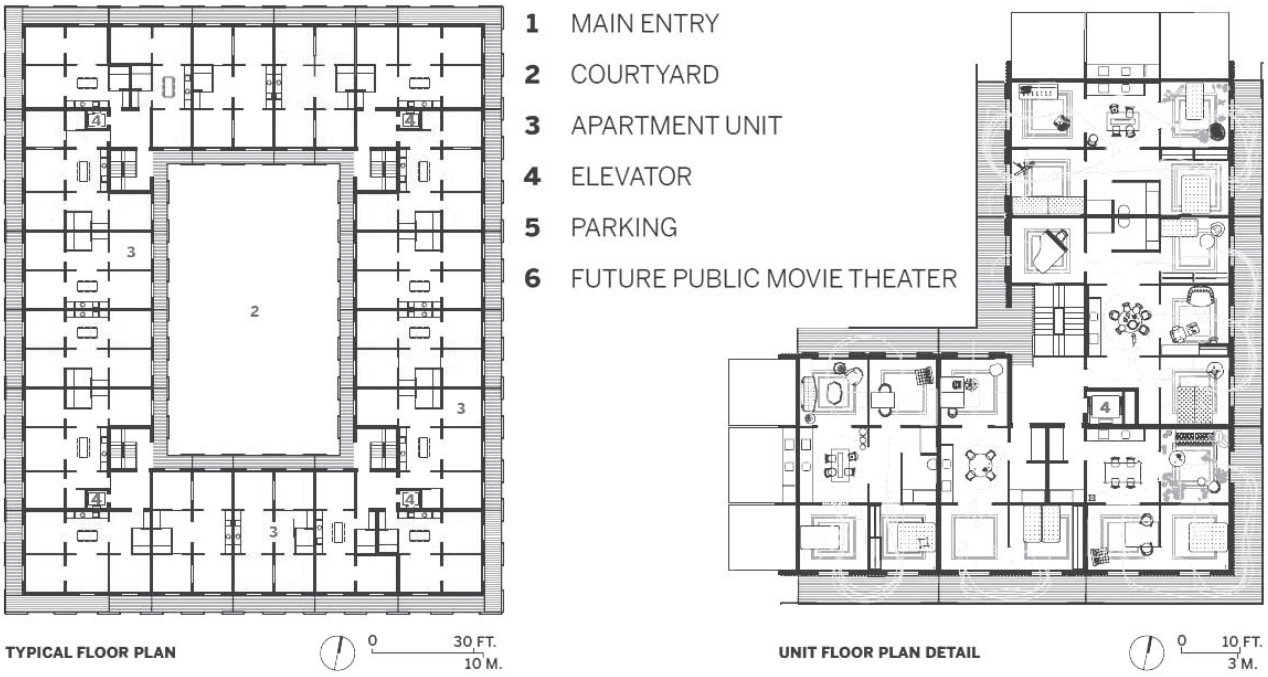


Figure 5.5 Generality in housing (Project: 85 Social Dwellings in Cornellà by Peris+Toral.arquitectes)
Note. The image is from the website Archdaily.com

Figure 5.6 Daytime (left) and nighttime (right) use of space
Note. The image is from the website Archilovers.com

Figure 5.7 Flexibility in housing

Note. The image was create by Agatángelo Soler Montellano (2022). Uso y percepción de las viviendas flexibles de Aranguren y Gallegos en Carabanchel. Informes de la Construcción, 74(566): e450. https://doi.org/10.3989/ic.86710

5.3 Guideline

According to the sub-research questions in this chapter:
(1)What spatial requirements are needed for adaptation to different stages of aging?
(2)What kind of living arrangement can help sandwich generation families live together with privacy and independence?
The themes of design guideline are divided into two main themes, privacy and adaptability, as follows:

Privacy

1. Separate and independent entrance is necessary
2. The house's entrance should be close to the kitchen to reduce the problem of interference between family members with different routine
3. The design of the room should be aimed at each person to have their room to avoid overcrowding
4. The size of the bedroom should consider the space for a sofa in addition to the space for a bed and closet
6. The bathroom should be close to the room; a separate personal bathroom is preferred
7. The location of the kitchen should take into account the different living habits, for example, kitchen next to the bedroom should be avoid
8. In order to accommodate different lifestyles, it is preferable to have two-way entrances in the kitchen
9. The partition walls and doors between rooms and the material of the ceiling should consider sound insulation
10. Multi-functional spaces can provide flexibility in the use of space for different life stages
11. There are two types of space configurations: horizontal and vertical.

Adaptability

1. A modular frame structure maximizes adaptability
2. Centralized equipment space can increase the elasticity of space
3. Rooms should be designed with a neutral nature in mind
4. Using movable walls or furniture to increase the flexibility of space use

Chapter 6
Case study

6.1 Three generational Housing

The following cases are selected:
(1) Winter Garden Housing by Atelier Kempe Thill
(2) Curaçaostraat Groningen by KAW Architecten
(3) Binh House by VTN Architect
The aim of this category of case study is to obtain the knowledge about how multi-generational living can be arranged, how two household can be connected, how to keep privacy of two households, and what are the drawbacks of these layouts. Therefore, the analysis focuses on layout of plan , connection of households, implementation of privacy.

Winter Garden House

Location: Antwerp Nieuw-Zuid, Belgium
Year: 2014
Typology: apartment
Unit size: 40 sqm & 123 sqm
Program: 32 apartments, Commercial spaces, underground parking
Architect: Atelier Kempe Thill

figure 7.1 Master plan (Atelier Kempe Thill, 2014)

figure 7.2 Building facade (Atelier Kempe Thill, 2014)

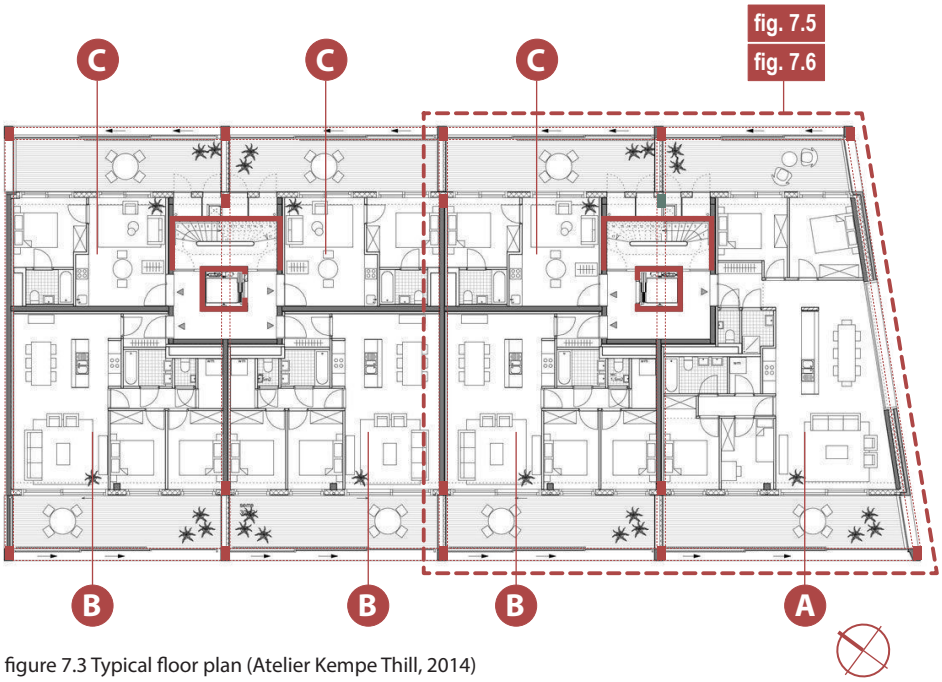


figure 7.3 Typical floor plan (Atelier Kempe Thill, 2014)

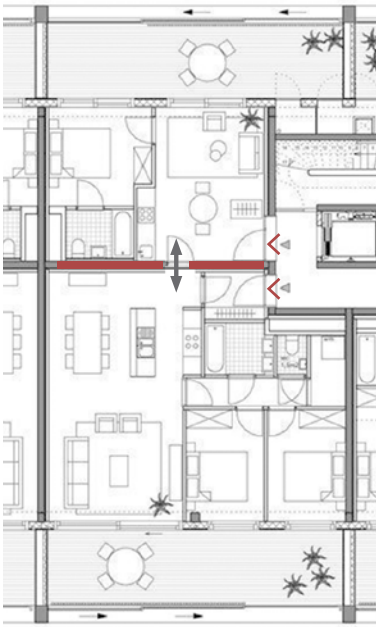


figure 7.4 Kangaroo living (Atelier Kempe Thill, 2014)

Two vertical cores of circulation serve three and two households on each floor. Household of type A, the biggest household with 123 sqm, can accommodate three generations. Four rooms are divided into two zones by shared space (living room, dining room, kitchen). Each zone has a bathroom and toilet. One of the zones next to the living room has a door to separate public and private areas. Besides the contribution to privacy, it can insulate the noise and avoid disrupting activities between two spaces. The same concept is applied to type B that is fit for the nuclear family. The third type of household is type C, designed for single families or couples. All households have a big indoor balcony with a depth of 2.6 m.

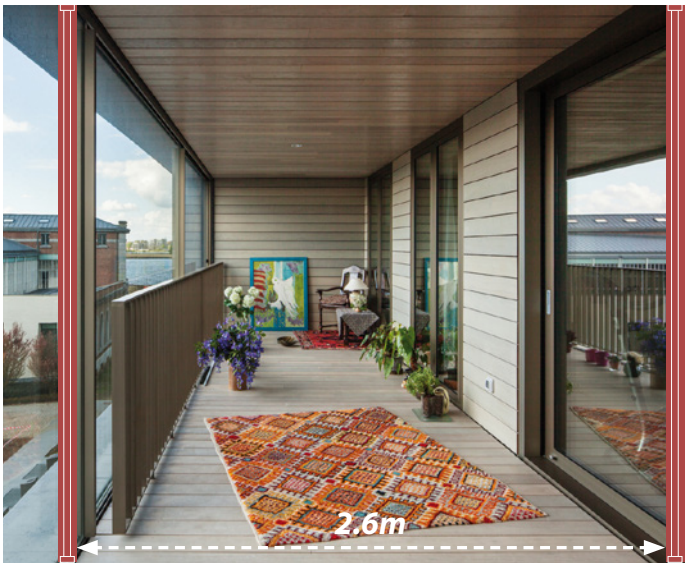


figure 7.5 Indoor balcony (Atelier Kempe Thill, 2014)

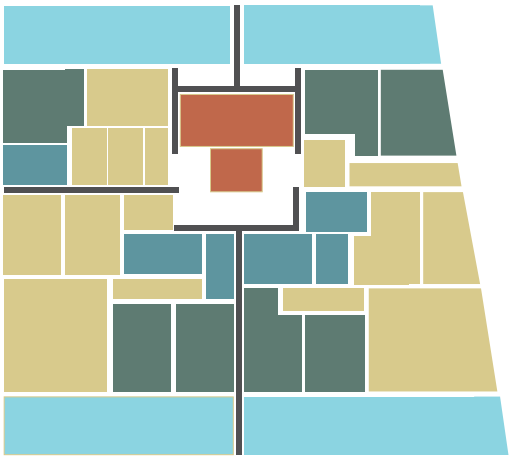


figure 7.6 Division of room functions of typical floor (illustrated by author)

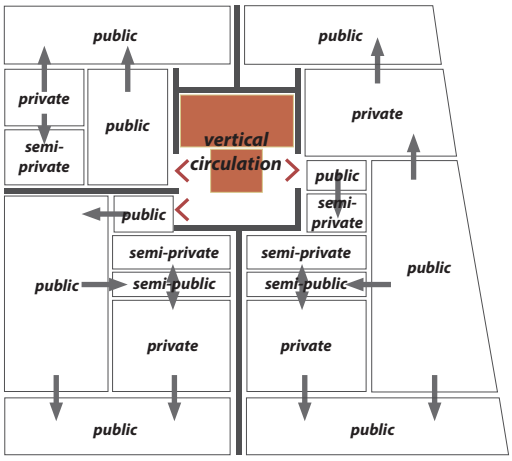


figure 7.7 Adjacency of social attribute of typical floor (illustrated by author)

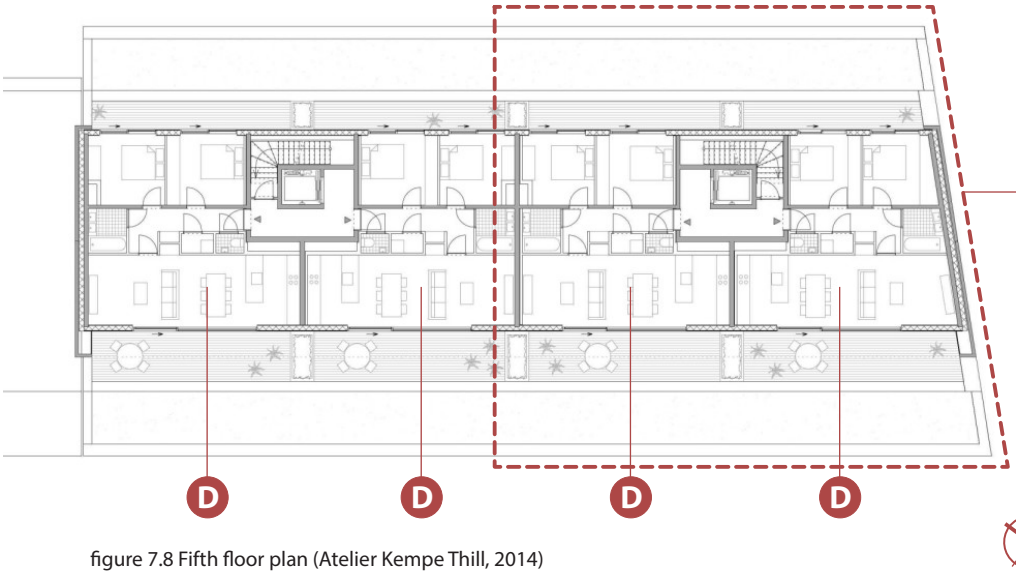


fig. 7.10 fig. 7.11

figure 7.8 Fifth floor plan (Atelier Kempe Thill, 2014)

Household of type D is only placed on the fifth floor. The shared and private zones are separated by corridor and service device (bathroom and toilet). Each side has its balcony. This arrangement can ensure that the activities in the shared space do not interrupt the people in the room.

The frame structure and flexible separation walls provide an opportunity to cater to different families, which is the kangaroo principle (Atelier Kempe Thill, 2014). For example, opening a hole in the wall between type B and type C can make a kangaroo apartment that each household keeps its individual space and cares for each other simply through a door.

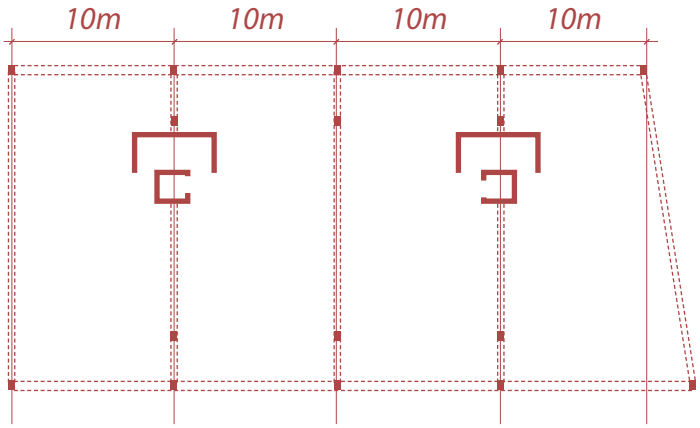


figure 7.9 Frames structure (illustrated by author)

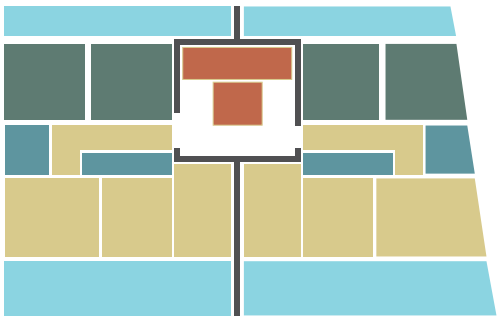


figure 7.10 Division of room functions of the fifth floor (illustrated by author)

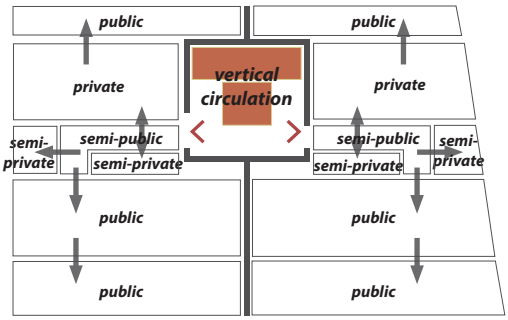


figure 7.11Adjacency of social attribute of the fifth floor (illustrated by author)

Curaçaostraat Groningen

Location: Groningen, the Netherlands
Year: 2014
Typology: apartment
Unit size: Kangaroo type (109 sqm+86 sqm)
Program: 16 single family apartments, 22 kangaroo apartments, 20 starter apartments
Architect: KAW Architecten

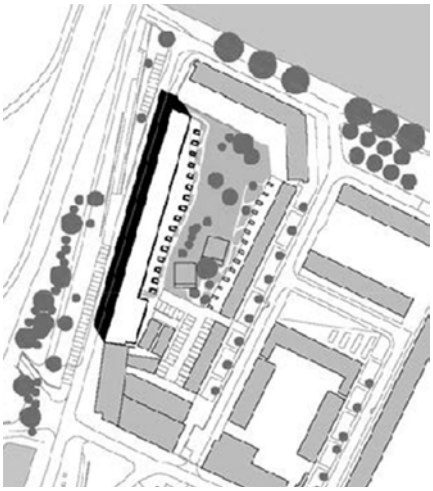


figure 7.13 West facade (Kaw Architecten 2014)

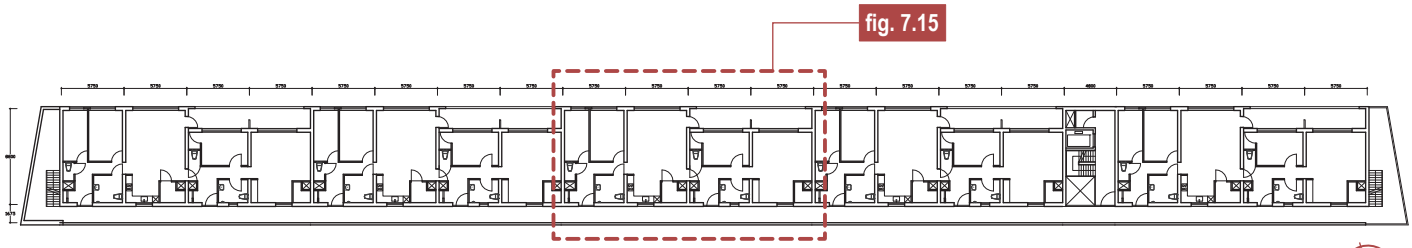


figure 7.14 Kangaroo apartment second floor to third floor plan (illustrated by author)

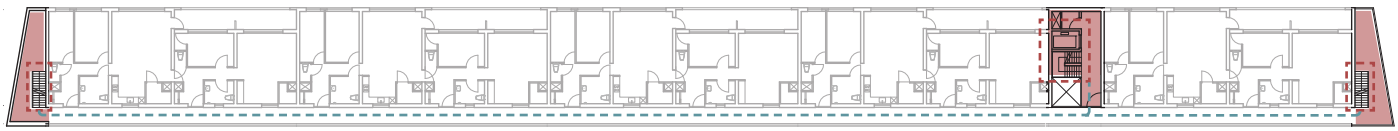


figure 7.15 Horizontal and vertical circulation (illustrated by author)

Kangaroo units, located on the second floor and third floor, are designed for people who need daily care. They consist of one large and one small residential unit, where the caregiver and the care recipient have their own individual living space. (fig. 7.14)There are 10 kangaroo units on each floor, with three staircases and an elevator connecting each floor, and an outdoor corridor connecting each residential unit. (fig. 7.15)

As mentioned above, the Kangaroo unit is composed of two apartments, one large 109 sqm apartment and one smaller 86 sqm apartment, both with accessible bathrooms, separate kitchens, and storage rooms. The two units are connected by two soundproof doors, one leading directly to the living space of the other unit, providing direct care services, and the other to a shared balcony, providing another opportunity for the caregiver and the care recipient to share the space of their choice.

figure 7.16 East facade (Kaw Architecten)

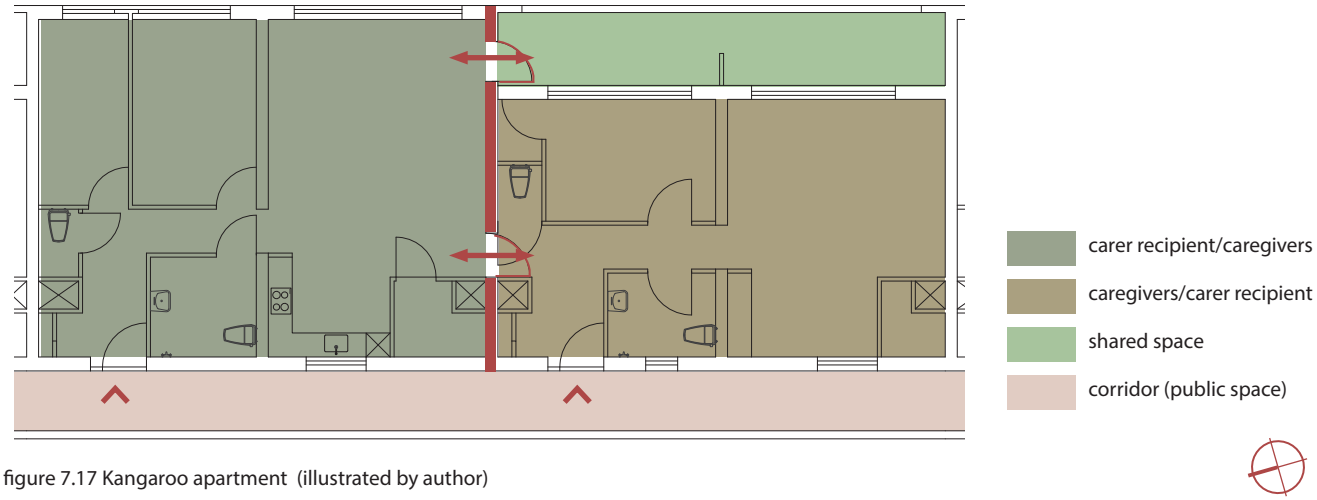


figure 7.17 Kangaroo apartment (illustrated by author)

The front door connects to the bedroom and the bathroom, which allows caregivers to go to the care recipient's room directly after entering the unit rather than going through all the other living spaces. The order of each space is consistent with the needs of caregivers in the study by Petterssib C. et al. (2021), where caregivers felt that bedrooms and bathrooms should be close to the entrance so that they could avoid walking through all the rooms and disturbing the residents' relatives.

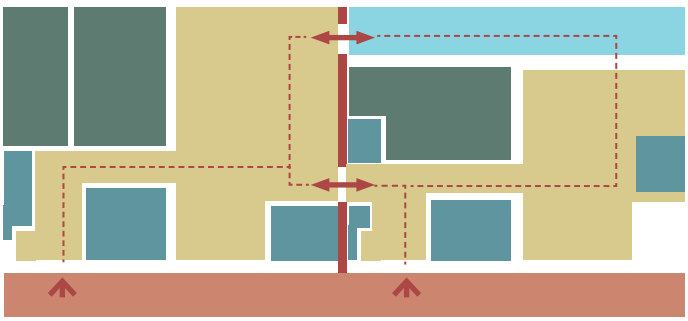


figure 7.18 Division of room functions (illustrated by author)

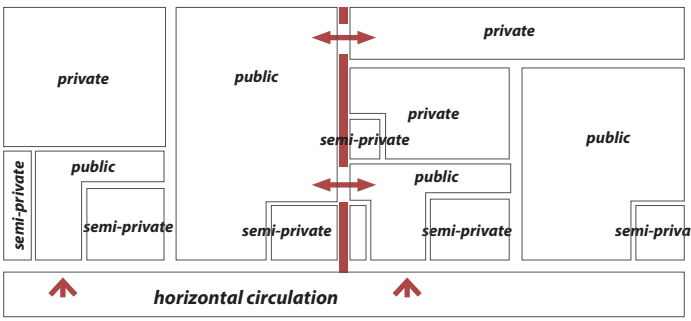


figure 7.19 Adjacency of social attribute (illustrated by author)

Binh House

Location: Ho Chi Minh City, Vietnam
Year: 2016
Typology: detached house
Area: 233 sqm
Stories: 3 stories
Program: private house
Architect: VTN Architects

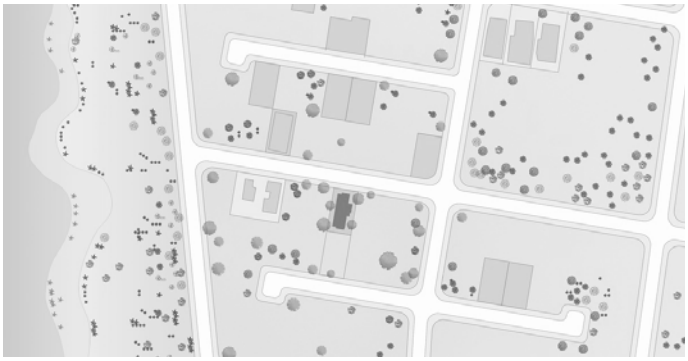


figure 7.20 Master plan (Atelier Kempe Thill, 2014)

figure 7.21 Division of room functions (VTN Architects, 2016)

figure 7.22 Division of room functions (VTN Architects, 2016)

figure 7.23 Division of room functions (VTN Architects, 2016)

The project is a single house for a family of three generation. This detached house is composed of three floors of rooms linked by a vertical service core comprising staircase, kitchen, bathroom, and toilet (fig. 7.24). In total there are three rooms, a dining room. a living room, a toilet, and three bathrooms, each separated by an indoor atrium and outdoor garden but connected together (fig. 7.29). Each room has its privacy while connecting to each other visually (fig. 7.23). The independence of private space is maximized by the vertical arrangement of floating boxes and one vertical circulation.

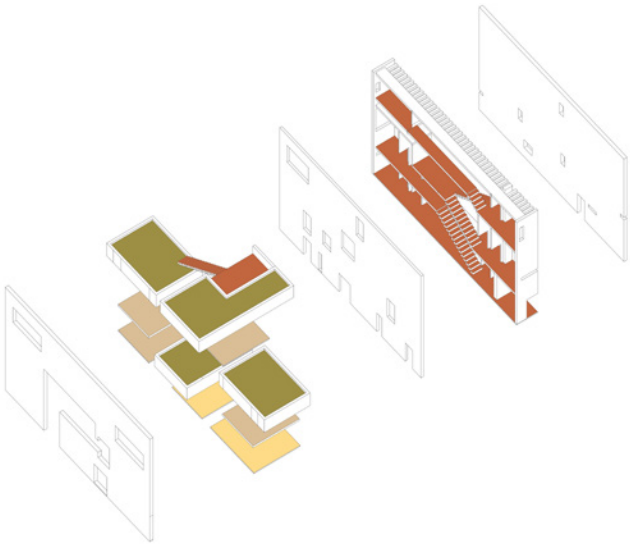


figure 7.24 Division of room functions (illustrated by author)

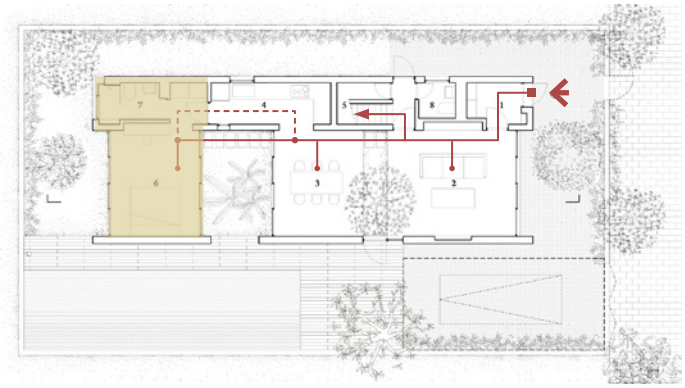


figure 7.25 Division of room functions (VTN Architects, 2016)

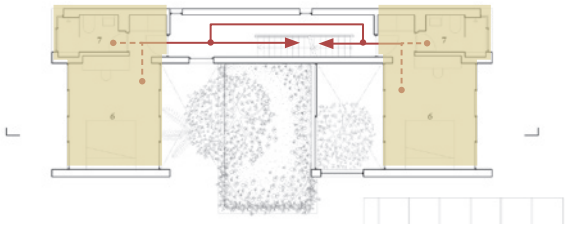


figure 7.26 Division of room functions (VTN Architects, 2016)

The floating garden, indoor courtyard, and roof garden play a significant role in regulating the temperature. The architects use the configuration of vertical space to drive passive cooling and stimulate ventilation. Moreover, the heat from the sunlight is filtered by the floating garden, which balances brightness and temperature.

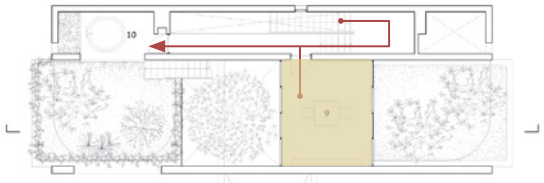


figure 7.27 Division of room functions (VTN Architects, 2016)

The continuity of space was designed by creating an open layout. For example, an indoor garden separates the living room and dining room without walls; therefore, the line of sight reaches beyond the other rooms. The service space, such as the kitchen, bathrooms, stairs, and corridors, is located in the west to prevent the heat radiation from affecting frequently used rooms where people stay longer.

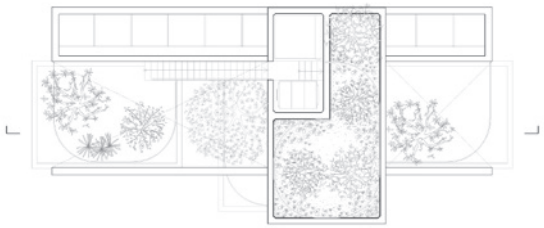


figure 7.28 Division of room functions (VTN Architects, 2016)

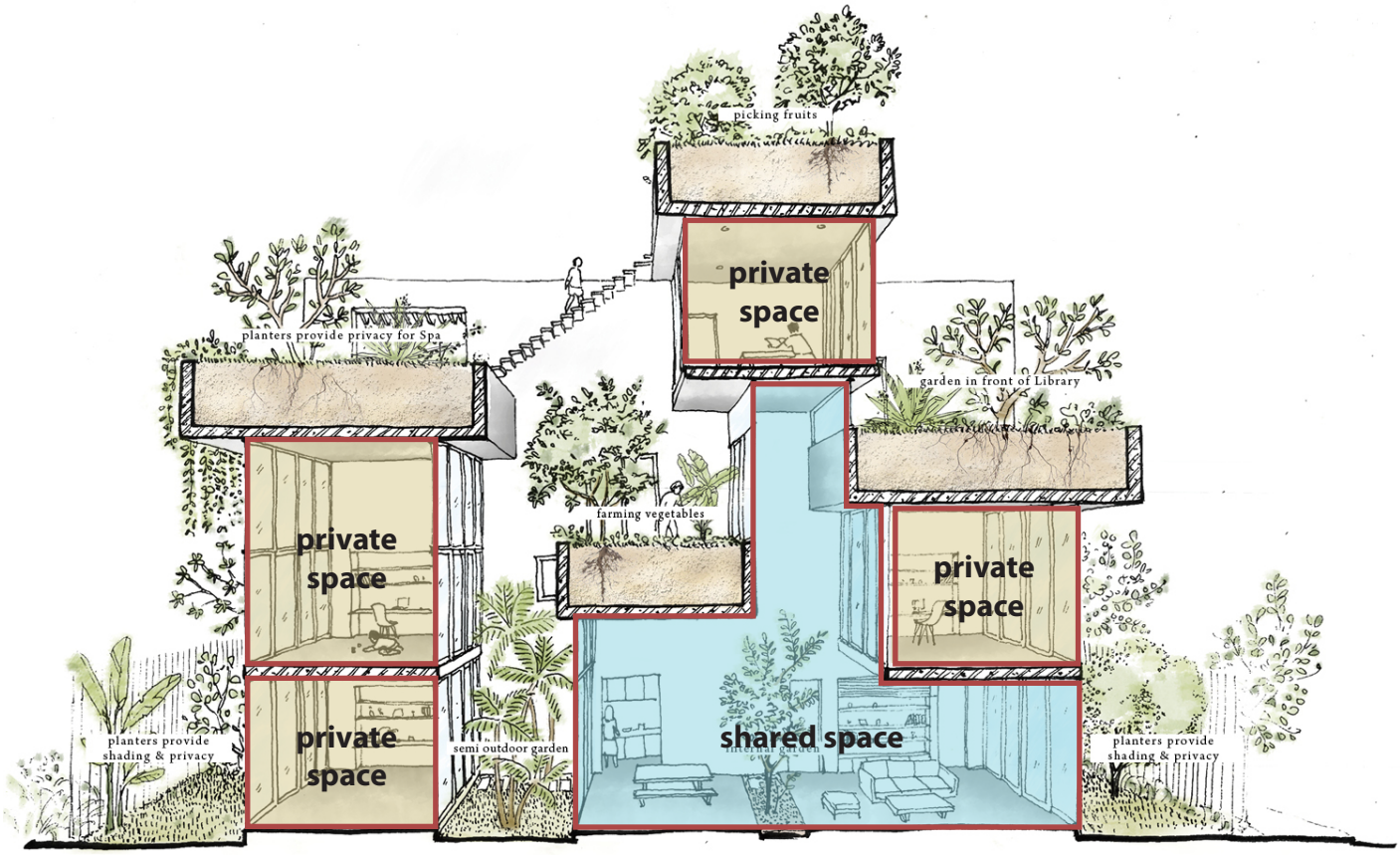


figure 7.29 Division of room functions (illustrated by author)

6.2 Senior daycare center

John Morden Centre

Location: South-east London, UK
Year: 2019
Typology: day care facility
Unit size: 911 sqm
Program: doctor consultation rooms, cafe, event hall, art studio, garden
Architect: Mae Architects

figure 7.20 Master plan (Mae Architects, 2019)

figure 7.31 Courtyard, pitched roof, transparent corridor, and chimney (Mae Architects, 2019)

This daycare center is part of a retirement community that is made up of 300 senior residents. The space is divided into two parts: medical facilities for doctors and a medical consultation room, and space for residents to socialize and participate in activities. The function of the space and its size is shown in figure 7.32. The purpose of the facility is to prevent the loneliness of the elderly. Each space is connected by a corridor that runs the length of the building. The large windows, skylights, and high ceilings allow for ample natural light that combines with the wooden walls and furniture to create a warm interior atmosphere. The natural ventilation is driven by the unique pitched roof and chimney. The courtyard is the center point of the building. As the corridor is built by continuous transparent floor-to-ceiling windows, people in each public space, such as the canteen, craft workshop, event hall, and even the seats outside the offices, can enjoy the scenery of the courtyard. The transparency among rooms also benefits the worker to observe and can take action immediately when an accident occurs.

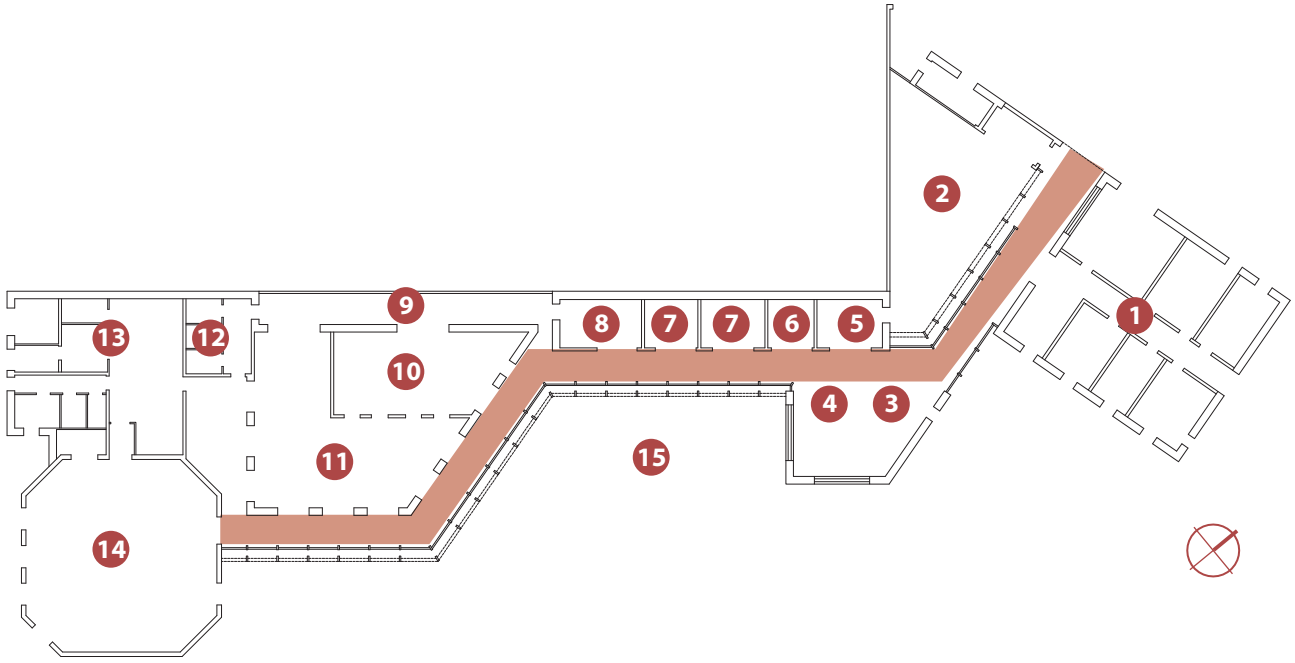


figure 7.32 Ground floor plan (illustrated by author)

	Program	Area(m^2)		Program	Area(m^2)
1	consulting room	166.3	9	yard	37.5
2	courtyard	40.2	10	craft workshop	58.5
3	reception	33.3	11	canteen	100
4	lounge	32	12	WC	21.4
5	shop	12.4	13	kitchen + servery	100
6	WC + IT room	6+3.8	14	event hall + storage	160
7	office	25.4	15	terrace + garden	---
8	wellbeing suite	16			

figure 7.33 Size of the spaces (illustrated by author)

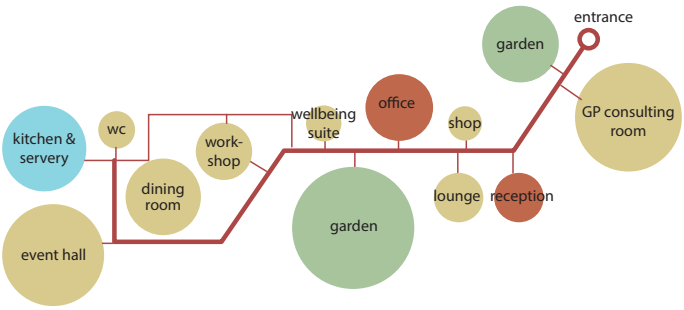


figure 7.34 Division of room functions (illustrated by author)

figure 7.35 Corridor and the seats outside the offices (illustrated by author)

figure 7.36 Canteen with big windows and high ceiling (illustrated by author)

6.3 Community center

In this architectural type, the Health Welfare Exchange Center is chosen. The purpose of analyzing this community center is to gain knowledge about what kind of function is needed in community center. Moreover, because this is a social welfare facility integrated with social housing, the spatial division of residential facilities and public facilities, and the arrangement of circulation are also analyzed.

Health Welfare Exchange Center

Location: Yokohama city, Japan
Year: 2017
Typology: Community center
Area:2683.59sqm
Program: library, clinic, spa, multipurpose space, shared kitchen, workshop, conference room,
Architect: Koizumi Atelier

figure 7.35 Division of programs (Shinkenchiku magazine, issue 2019)

figure 7.36 West-northern facade (illustrated by author)

The project is a renovation of a former welfare facility and social housing. The housing complex is composed of one basement and a nine-story building (fig. 7.35). The health and welfare space for residents and neighborhoods is placed on the ground floor and first floor (fig. 7.36). The social housing comprises 80 units from the second to the eighth floor. The building was built on a street corner in a residential area with a plaza for public activities.

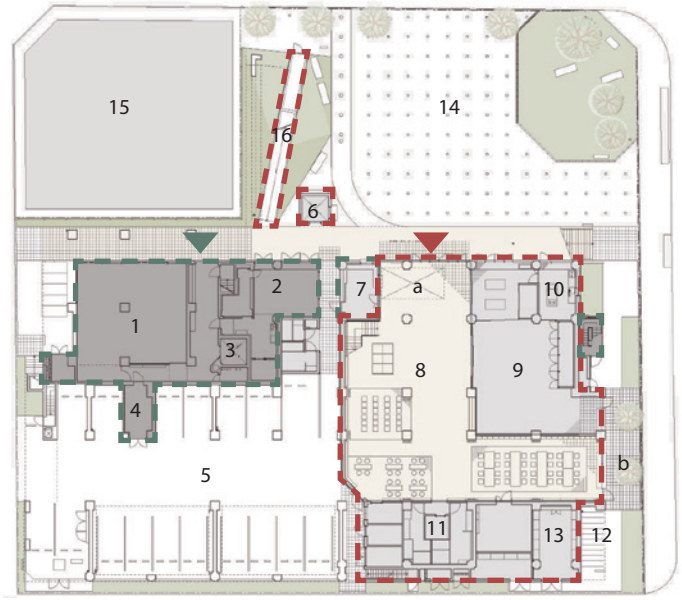


figure 7.37 Division of room functions (illustrated by author)

figure 7.38 Division of room functions (illustrated by author)

Functions

The community center consists of a citizen space on the second floor and a healthcare space on the second floor. The citizen space contains a public library, a public lounge, a multi-purpose room, and a shared kitchen. It is separated from the residential zone by a common corridor, which is shown by the green line in figure 7.37. In terms of healthcare space, it includes a clinic, a daycare room, and a public bathhouse.

Circulation

There are separate elevators and staircases for residential and community centers. Doors provide security control, so residents and people in the public space do not interfere with each other's movement. In addition to an elevator, there is an outdoor staircase that extends from the street to a corridor directly to the second floor. Additionally, a barrier-free ramp connects from another street to the second floor.

Program		Program		Program	
1	Bike parking	9	Multi-purposed room	17	Co-working space
2	Conference room	10	Shared kitchen	18	Health consultant
3	Elevator (private)	11	WC	19	Meeting room
4	Garbage room	12	Bike parking	20	Activities space
5	Car parking	13	Storage	21	Office
6	Elevator (public)	14	Plaza	22	Public bathhouse
7	Security office	15	Employment agency	23	Clinic
8	Lounge	16	Slope	24	Daycare room

figure 7.33 Size of the spaces (illustrated by author)

figure 7.39 Division of room functions (illustrated by author)

figure 7.39 Division of room functions (illustrated by author)

Chapter 7
Conclusion and Reflection

7.1 Conclusion

In this thesis, the main research question to be addressed is **"How can a housing design contribute to the quality of life of adult children and their parents in relation to care and living together?"** In addition, the following five sub-research questions are examined to obtain specific answers and details.

1. What kind of care do adult children give to their parents?
2. What factors influence the quality of life of adults and their aging parents in terms of caregiving?
3. What spatial requirements are needed for care and adaptation to different stages of aging?
4. What kind of living arrangement can help sandwich generation families live together with privacy and independence?

First, by understanding the nature of the two target groups and the factors that contribute to their quality of life, it can be determined that the quality of life of both groups is related to the level of mobility of the care recipient. Furthermore, in a multigenerational (mostly three-generation) living pattern, it is crucial to have control of one's territory and complete independent space to ensure personal privacy and independence. Lastly, the home's adaptability accommodates the needs of different generations at various life stages to achieve the possibility of continuous aging at home.

For caregivers, the mobility of older adults is an inverse relationship to the caregiving burden, whereas personal care can cause physical injuries to caregivers that impact the quality of care. Poor quality of care is associated with a higher psychological burden on the caregiver and a greater risk of injury to the elderly. Therefore, care with the help of assistive devices can improve the quality of life of caregivers in terms of physical aspects. As for the psychological burden and social isolation caused by the long time spent caring for older adults with a high dependency level, it can be solved by establishing senior daycare and increasing social interactions between neighbors, such as increasing the intersection of routes, designing shared spaces, and the visibility of shared spaces.

For older adults, mobility is the most critical factor in their quality of life. With good mobility, older adults are less dependent on personal care, feel less guilty about being cared for, have more opportunities to socialize, and have closer relationships with neighbors, which improves their quality of life from a psychological aspect. Falls are the biggest obstacle to maintaining mobility, leading to dependence on personal care and decreased frequency of going outside. Ultimately, the person is forced to stay home for long periods, resulting in mental health problems that can lead to loneliness, so preventing falls is essential. By increasing the accessibility and safety of the home's interior and exterior, the risk of falls for the elderly can be reduced, such as even surfaces, indoor spaces without steps, accessibility of toilets at home, adequate lighting, safe and walkable environments, bench installation, and a variety of facilities and proximity; these environment-optimized designs not only prevent falls but also help maintain mobility and make the elderly healthier.

The main issues confronting a multigenerational (mostly three-generation) household are privacy and independence, which are factors that affect their quality of life. By understanding privacy and independence, controlling one's territory is essential, and its boundaries are variable. The number and location of doors, the size and crowdedness of the space, the routine related to the use of shared space, and the sound interference prevention give each person the most control in adjusting one's territory to achieve privacy and independence. Each one has its independent entrance, which the vertical and horizontal arrangement of the space can achieve. Adequate space and the number of rooms are essential to avoid overcrowding. The location of the kitchen and soundproofing is the key to providing a space without disturbing each other.

The adaptability of a home is essential because different generations require different spatial needs. Also, each individual's needs vary with time and age. Thus, by applying the three major design strategies of housing adaptability, residential spaces can have the ability to accommodate different groups of residents. First, the generality of a home is not to give the room a specific function so that the room can be transformed freely without physical changes, allowing the residents to change the function of each room. The flexibility is to use movable walls or furniture to define the size and layout of the space. Finally, elasticity is the possibility of combining or separating households, providing

the opportunity to expand or reduce the size of the home, primarily through the installation of complete residential facilities per household.

To conclude, housing design can contribute to the quality of care and maintain the mobility of older adults by understanding the needs of the caregiver and the care recipient regarding the quality of life. Moreover, promoting personal privacy and independence from spatial plans and spatial adaptability may increase the willingness of family members to live together.

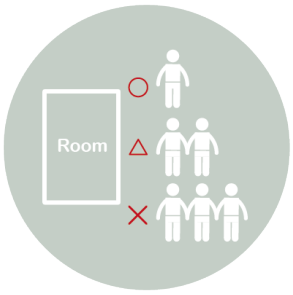
7.3 Design Guideline Summary

Guidelines of the home space for care and living together

Room Dimension

Open Layout

Toilet close to a bedroom



No more than 2 people

Assistive aid help eliminate injuries

Balcony

Toilet close to a front door

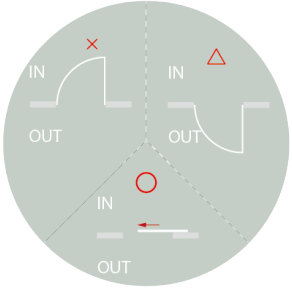
Horizontal space arrangement

Ceiling lifting aid is preferable

Ventilation / Fresh air

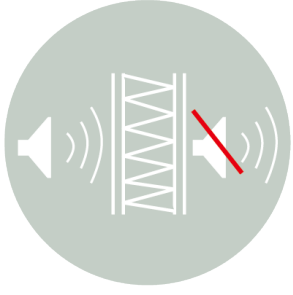
Kitchen close to a front door

Vertical space arrangement



Door Opening

Sufficient lighting



Sound insulation

Two or more separate doors

Guidelines of the neighborhoods

Visible bathroom

Adaptability

Seats / Benches

Medical daycare

Public transportation

Meeting spot

Park / Garden

Atrium

Stores / Super market

Intersection of routes

7.2 Reflection

Reflection of research-design process

Reflecting on the entire research process, it has been a challenging, frustrating, and interesting experience for me. This studio focuses on the theme of care and health. It differs from other studios in that the research approach focuses on understanding users and discussing the issues of care and housing for aging in a human-centered way. Therefore, through this research, I had the opportunity to meet the local people and learn more about the issue of the aging population in the Netherlands. I also had the opportunity to experience losing mobility in a wheelchair before the research started and to examine the friendliness of the whole built environment to people with mobility problems from the user's perspective. In this reflection chapter, I would like to share my findings and experiences throughout the graduation project process, from fieldwork, cultural differences, and the research-design process.

The way of conducting fieldwork is a unique method in this research. Before I came to the Netherlands to study, I had already heard that the Netherlands had developed well compared to Taiwan regarding elderly care and retirement living. Being a foreigner living in a senior citizen's residence is a unique opportunity and the first experience in my life. During my stay in het Kampje, I had the opportunity to chat with several residents, visit their homes and listen to their life stories. As a result, I gradually understood how Dutch society as a whole thinks about the care of the elderly: the elderly do not want to be a burden to their children, so most of them go to better-equipped elderly housing or nursing homes on their own initiative when they grow old, and their children also think that the government cares for the elderly is a preferable option. This is very different from Taiwan. Although the overall social atmosphere in Taiwan has gradually changed in recent years with the expansion of long-term care facilities and senior daycare centers, most of the elderly are still looked after by their own children and live together for convenience due to the influence of culture and traditional values.

At the beginning of the research, I had doubts that my research topic might not be suitable in the context of the Dutch society because, as mentioned

above, the elderly in the Netherlands prefer going to nursing homes rather than being a burden to their children, and the Dutch society, in general, considers the care of the elderly to be a matter for the government. However, after discussions with professors, literature research, checking local news in the Netherlands, and talking with friends, it became clear that such a situation, where the government is solely responsible, may not be the norm anymore, as policy changes, budget cuts in medical care for the elderly, and news of nursing home queues abound, making aging at home the most likely outcome. In addition to the shortage of housing, high housing prices, and the fact that young people are leaving their homes for longer and longer periods, this has motivated me to think and speculate that family living together and caring for each other may be one of the solutions to the aging society in the Netherlands.

The most challenging part of the study was finding literature on multigenerational families and sandwich-generation caregivers in the Netherlands. Compared to the United States, Australia, China, or Taiwan, the Netherlands has relatively limited literature on multigenerational families, and the data shows that the percentage of Dutch people living with their parents is the lowest in Europe, with very few studies or reports showing what Dutch people think about living with their parents. Therefore, after P2, I interviewed several friends from the Netherlands and European countries to discover their perceptions of living under the same roof with their parents. From the results, it seems that it is not as absolute as the literature, but also that some people consider that multigenerational cohabitation can be considered as long as it ensures privacy and autonomy for each person. This interview process became the main reason that gave me the confidence to continue with the study.

The process from research to design is enjoyable because it is not a one-way process but a cycle of back-and-forth verification. Firstly, according to the preliminary research conclusion, a suitable building location is selected, and then programs are set based on the site analysis and research results. When conducting massing studies, it is essential to consider the rationality of the built environment and whether it is consistent with the research findings. Also, when design evidence is found to be insufficient, it is necessary to go back to the literature, case studies, and interviews to complete it. For example, in P2, I designed a daycare center as a residential facility without defining whether it would be medical care or non-medical care oriented. However, after a visit to an Ontmoeten in Dutch society between P2 and P3, I realized that the daycare center I had designed was supposed to be a medical care type for the elderly who were in relatively poor health. Therefore, the daycare centers in this graduation project were ultimately divided into healthcare-oriented daycare and ontmoten, which are similar to community centers.

After P2, the discussion with Birgit and Lex helped me greatly to increase the width of my thinking about the design. For example, the massing scheme I chose in P2 did not correspond to the urban environment of the location, so they advised me to rethink other massing schemes. I, therefore, reexamined the whole volume from the model and site photos and finally chose a high rise that was more in line with the urban environment. In addition, when considering the structural type, the discussion with Lex also inspired me to think from the perspective of circularity. Finally, I decided to replace the concrete structure with a hybrid structure made of timber and concrete, which can minimize carbon emissions, shorten construction time, and create a healthy environment, making the overall solution more aligned with health and care needs.

From P2 to P3, I designed almost different floor plans for each level to create semi-outdoor space, so I spent much time on floor plan design. However, I did not notice that when transferring from concept to actual house size, the two originally designed high-rise houses would interfere with each other's sunlight area and fail to provide the maximum amount of sunlight to the residents. Therefore, I made a relatively significant change in the design by reducing the volume of the two houses to one, and in order to provide more daylight, I removed some of the units and designed a more extensive lighting surface that allows sunlight to penetrate the atrium and the communal space in the houses. In addition, based on the feedback I received from P3, I focused more on how people use the communal spaces of housing, such as corridor and roof space, and how residents access the community centers, libraries, meeting spots, and daycare centers on the lower floors, besides the floor plans of the housing units. During this process, I learned that the logic of building structures differs for various materials, such as wood, concrete, and

a hybrid structure. Besides, because I am from a subtropical country, I have little knowledge of the climate design related to architecture in Northern Europe, so it was pretty challenging to consider the design of high-rise buildings and to draw detailed drawings, such as the insulation design and the ventilation shaft setting.

In summary, throughout the research-to-design process, I learned how to find literature, filter the necessary knowledge from the literature, and finally integrate it into my thesis; also realized that doing research is not only reading literature but also field research, observing behaviors, and interviews, I can obtain more direct knowledge than literature and apply it in my thesis. Finally, the design process is a unique self-learning process in which the research results are applied to the design process because the previous solid research results make the design process logical and the design direction clear.

The relation between your graduation project topic, Architecture master track and Architecture master programme

Caring for people with architectural space is the most central goal of this graduation design studio. Moreover, this graduation studio's concept and teaching content focus on the space and its users and encourage observation and interaction with target groups. The aging society has been an inevitable issue in recent years, and Dutch society is also facing this problem of an aging population, elderly care, and living. In order to meet the care and housing needs of the elderly, the living model and housing typology gradually developed differently. In recent years, there have been more so-called intergenerational cohousing (non-blood relationship), retirement housing, and kangaroo housing (rarely) in Dutch society. However, in an aging society, in addition to the elderly, another group is significant and needs to be considered: family caregivers.

After the Dutch healthcare reform, family caregivers have become increasingly important because of the shortage of professional caregivers. Additionally, due to the shortage of nursing homes, seniors are increasingly likely to live at home and be cared for by family members, thus making family caregivers an essential and critical part of the care relationship and the overall healthcare system. However, the caregiver is often in a variety of roles at the same time; for example, the caregiver may be a carer, a mother, and a daughter, and this in-between generation is my target group - the Sandwich Generation. They are exposed to different stresses and burdens that are rarely discussed. Even in home spaces, they often suffer from physical injuries, and the quality of care decreases because the space cannot meet the care needs, directly affecting the quality of life and care for the elderly.
Hence, under the core objective of the studio and the current issue of elderly care in the Netherlands, my graduation project aims to design a house that can accommodate family members who are kin to care for each other and live together. Most importantly, it addresses the issue of aging care by designing homes to reduce the burden on caregivers, maintain the autonomy of the elderly, and increase the possibility of families living together.

How did the research influence the design/recommendations and how did the design/recommendations influence the research?

The primary target groups of the study are family caregivers and the elderly in the sandwich generation. Living in Het Kampje at the beginning of the research gave a crucial start to this research:

1. An overview of the current situation of elderly living in the Netherlands was obtained: the behavior and needs of the elderly.
2. Knowing that medical care and personal care in the Netherlands are different from my culture gave an obvious direction to the literature search. For example, it was essential to know the different definitions of healthcare and who the caregivers are, the relationship between quality of care and quality of life, and how to interview the target groups and find out from their answers what factors influence the quality of care.
3. I have learned that the design of the built environment ought to create an environment that is not only friendly to the elderly but also to the caregivers to tackle the issue of elderly care effectively.

Moreover, when searching for cases or articles related to multi-generational housing, I found that the case study revealed that multi-generational housing is rare in the Netherlands and only existed as kangaroo houses in the suburbs or single-family houses in the recent past but rarely in mid- to high-rise houses in the city, which makes the study more difficult. As a result, it is only possible to analyze

the type of housing and the factors that should be considered concerning living together in Australia, the United States, or other Asian countries. Finally, regarding care space requirements, personal care is usually provided by professional caregivers in the Netherlands, so there are relatively few studies of family caregivers providing personal care. Therefore, care space requirements can only be investigated from relevant studies on professional caregivers.

Starting with P2 and progressing to the design phase, the site selection approach was based on the previous research discussions to determine the space and neighborhood amenities needed for seniors and caregivers. As a result, the future Bickhorst neighborhood was selected for its accessibility, pedestrian friendliness, and amenities.

From the feedback of the mentor professors and examiners, two weaknesses were mentioned in the research: 1. the needs of the youngest generation of the sandwich generation were not discussed; 2. the interviewees were Asian, and there was a lack of data from Europe and the Netherlands. Thus, between P2 and P3, I interviewed ten people from Europe and the Netherlands between the ages of 25 and 34 to understand their needs through additional interviews, which immensely helped the architectural project program. In addition, during the P3 design process, it was found that research on the spatial needs of seniors and caregivers for the homes themselves was incomplete and limited to universal and accessible design in general, so the content of the literature study was added about ways to increase the quality of care, reduce caregiver injuries, spatial factors to prevent falls and enhance social interaction.

The process of research to design is a continuous back-and-forth process, making it possible to apply the research to the design practice. The final result of this research and design is a high-rise housing in the urban context with close facilities and transportation for the sandwich generation that maintains the independence and autonomy of each family member while allowing them to care for each other at all times. Moreover, the home space, the community, and the neighborhood, with a particular focus on injury prevention and an age-friendly environment, will enhance the quality of life for both caregivers and cared for, ultimately achieving the long-term goal of aging at home.

How do you assess the value of your way of working (your approach, your used methods, used methodology)?

In the research report, literature research, fieldwork, interviews, and case studies were used. Knowledge of the factors affecting the quality of life of caregivers and older adults, the physical impairment associated with caregiving, and the maintenance of mobility in older adults was obtained from literature studies. The remaining aspects, such as elderly behavior, living habits, caregiver feedback on space use, space for care needs, and European perceptions of family living together, were learned through fieldwork, interviews, and case studies. Using these methods above, I integrate essential information that can be applied to the design into the study.

In terms of the interviews, I think there is too little information about informal caregivers in the Netherlands because the caregivers interviewed were all Asian (the author's parents and friends). On the other hand, the Dutch interviewees had no experience of informal caregiving and, therefore, could only draw from them their willingness, imagination, and advice about living with their parents. Furthermore, in the case study, except for Winter Garden House and Curaçaostraat Groningen, there were few mid-rise and high-rise residential projects with multi-generational families, so evaluating their comparison with existing projects was impossible. Consequently, the final design principles are results from the research of various theories. From another point of view, the final design principle has the value of reference, and the design results are experimental.

How do you assess the academic and societal value, scope and implication of your graduation project, including ethical aspects?

During the process of literature and case studies, so-called Kangoeroewoning can be found in the Netherlands, mainly in the suburbs or in the countryside. Furthermore, the housing typology is mainly single houses, such as the Three generation house in Amsterdam, or apartments designed for the non-blood care relationship, such as Curaçaostraat Groningen. However, there is no high-rise housing in the city designed for the Sandwich Generation that is easy to care for among family members and age-friendly. My graduation project proposes an alternative way of thinking

about aging care in living. It challenges the notion of caring for parents in Dutch society, which I think is socially relevant in both aspects and creates an opportunity for an interesting academic discussion on housing and elderly care.

Such discussions have been occurring throughout the research and design process. At first, without conducting a complete literature study, I did not realize that the Dutch and Taiwanese societies had different notions of the responsibility of caring for the elderly. Therefore, I did not find any problems with family members living together. However, in the conversation with professors, Dutch people, and even Europeans, I discovered that most people hesitate to live with their parents, making the research process much more difficult. I even felt that I had chosen the wrong research direction. However, after learning more about the Dutch healthcare reform, such as people lining up for nursing homes and the decreasing number of professional caregivers, the current living model and reliance on the government to care for the elderly no longer works. Thus, I strongly believe that living with families and caring for each other is one of the options to solve the problem of aging care.

Concerning the ethical part of the research, the difficult part was when I stayed at het Kampje. As I do not speak Dutch, even though my classmates helped me to ask some questions, I usually could only observe and write them down in my notebook. This situation might not seem like a problem. However, because I was an outsider, and the residents did not know me, while I could not explain what I was doing in time, it was very much like I was peeping into people's lives. So sometimes, the residents would walk back and forth to observe what I was doing, which stressed me. To resolve this dilemma, I initiated a pre-study observation exercise, focusing on each observation rather than immediately recording what I observed. I would wait until the library was empty and then write down my observations throughout the day; instead of bringing a notebook with me during the day, I imagined myself as a resident and tried to make eye and facial contact with them as much as possible. On the third day, the residents gradually embraced me, and a lady even invited me to her guitar practice activity. We had dinner together last night and sang some popular English songs. This last night made me feel part of their lives, and the awkwardness disappeared.

How do you assess the value of the transferability of your project results?

My project is transferable but may be faster to realize in Asia than in Europe. The concept of living together, in particular, is understood and accepted differently by people because of cultural differences. The project initially started from my cultural background. ThenBy the research process, I have connected it to the cultural context of the Netherlands so that the design principles could be applied in Europe (Netherlands) or Asia. For example, in Taiwan, it is natural to take care of parents, so it is common to live together. On the contrary, in the Netherlands, living together is less acceptable than in Taiwan because of the importance of privacy, independence, and complete healthcare welfare. The project thus analyzed this difference and developed a model of family cohabitation that can be applied in Dutch society.

Although living together may be a barrier due to cultural differences, other principles of spatial design and neighborhood amenities can be widely applied. These principles can be applied not only to multi-generational households but also to different types of housing. For example, the room's size must consider space for both the elderly and the caregiver to use assistive devices, toilets must be easily accessible, and there must be enough light in the room to prevent falls. These design principles are designed to improve caregiving support, enhance the mobility of the elderly, and increase the quality of life for both, thus achieving the vision of aging in place.

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Chapter 9
Appendix

Appendix A // Questionnaire

Questions for Questionnaire

Nationality: _____
Gender: _____
Age: _____

1. Do you live with your parents or alone?

2. When did you move out of your parent's home?

3. What do you find most disturbing when living with your parents? (Please give at least one example, preferably related to space, room size, sound insulation, privacy, etc.)

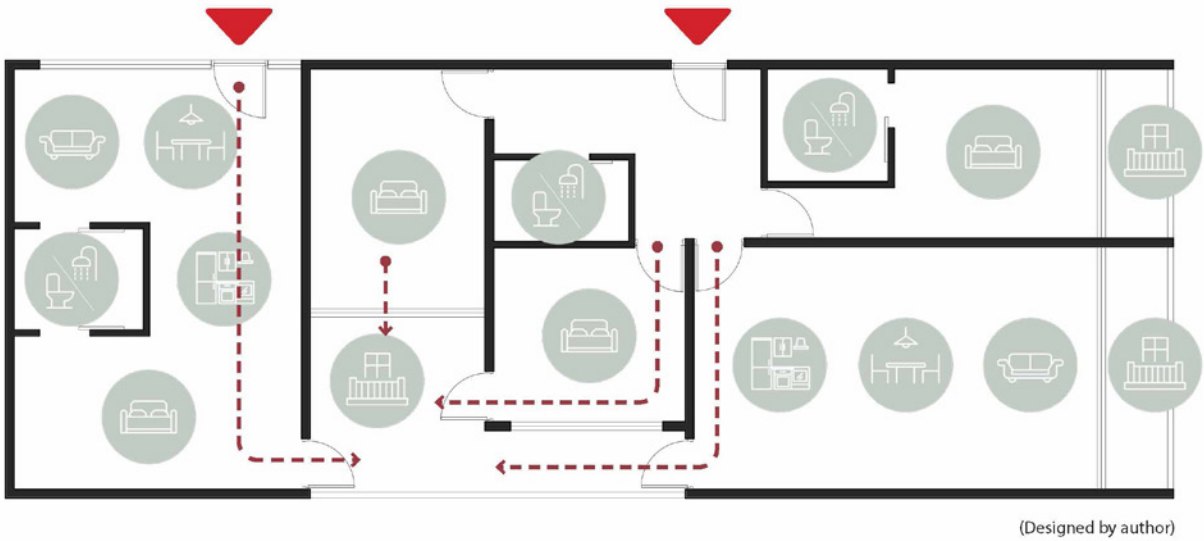
4. What do you like about living with your parents?

5. What do you need most in your home space if you had to live with your parents? (such as balcony, bedroom, bathroom, living room, kitchen... etc.) Why are those spaces so essential for you?

6. Which space at home do you think you can't share with your parents, and which room or space are you willing to use with them?

7. If you live with your parents, there are certain moments when you would like to be alone. What facilities would you most like to have near your home (café, library, gym, garden, etc.)? Or if there is any space in your home that can meet this purpose?

8. The following image is a hypothetical apartment house type where your parents live in a separate dwelling unit. You, your partner, and your children live in the two-bedroom unit next door, where you have a shared balcony and additional family space. You and your parents will live without any spatial interference. Do you think this lifestyle is acceptable? Is it feasible? If not, what part of it makes you think so?



(Designed by author)

Prototype of multigenerational living (horizontal)based on the research (situation 1: Parents are still independent + two kids family)

Nationality: Greek
Gender: Female
Age: 36

1. Do you live with your parents or alone?
: Alone.

2. When did you move out of your parent's home?
: 18

3. What do you find most disturbing when living with your parents? (Please give at least one example, preferably related to space, room size, sound insulation, privacy, etc.)
: Small living room that doesn't have enough room for everyone, no sound insulation so you cant sleep if it's noisy, the only place I have privacy is my bedroom

4. What do you like about living with your parents?
: Sharing meals with the whole family

5. What do you need most in your home space if you had to live with your parents? (such as balcony, bedroom, bathroom, living room, kitchen... etc.) Why are those spaces so essential for you?
: My own bedroom is essential, own bathroom and a balcony would be very nice to have, it's all about having privacy and being able to have moments alone to relax.

6. Which space at home do you think you can't share with your parents, and which room or space are you willing to use with them?
: If I had to live with my parents, it's ok to share the kitchen and living room.

7. If you live with your parents, there are certain moments when you would like to be alone. What facilities would you most like to have near your home (café, library, gym, garden, etc.)? Or if there is any space in your home that can meet this purpose?
: A garden would be ideal. A cafe near the home would also be nice.

8. The following image is a hypothetical apartment house type where your parents live in a separate dwelling unit. You, your partner, and your children live in the two-bedroom unit next door, where you have a shared balcony and additional family space. You and your parents will live without any spatial interference. Do you think this lifestyle is acceptable? Is it feasible? If not, what part of it makes you think so?
: This looks like it could work because there are enough separate spaces to guarantee privacy and comfort and also the shared family space for everyone to come together.depends on the relationship between the partner and the parents

Nationality: Greek
Gender: Female
Age: 27

1. Do you live with your parents or alone?
: Alone.

2. When did you move out of your parent's home?
: 24.

3. What do you find most disturbing when living with your parents? (Please give at least one example, preferably related to space, room size, sound insulation, privacy, etc.)
: What I find most disturbing is issues of privacy & control. For example, going out whenever you want and returning home as late as you want without having to inform your parents. Also, the fact that my parents are used in doing things their own way and they cannot easily change that causes some trouble at times.

4. What do you like about living with your parents?
: I like the sense of home, coziness and safety I feel. Living with your parents (and family) means you always have someone to talk to that can support and understand you. Also, I liked the fact that some things were ready for me (for example I didn't have to cook on a daily basis or worry about the supermarket etc.) Finally, financially speaking it was a way for me to save some money for my master's.

5. What do you need most in your home space if you had to live with your parents? (such as balcony, bedroom, bathroom, living room, kitchen... etc.) Why are those spaces so essential for you?
: If I had to go back to living with my parents I would like to have a separate entrance to the house, so that even though we are living together I still have my autonomy. I think that having kitchen and living room in common works for me since I like to share parts of my day with my parents. To conclude, all I would need would be a sufficient room size so that I can have something like a couch to invite friends over and a separate entrance.

6. Which space at home do you think you can't share with your parents, and which room or space are you willing to use with them?
: My bedroom would be my own private space. I would prefer to have my own bathroom but I wouldn't really mind to share it. Living room and kitchen I would like to have in common since it has always been the space where we meet, discuss and have fun.

7. If you live with your parents, there are certain moments when you would like to be alone. What facilities would you most like to have near your home (café, library, gym, garden, etc.)? Or if there is any space in your home that can meet this purpose?
I would like to have nearby a cafe (as a meeting space with friends), a gym and a park. A library would also be nice but not the first facility that comes in mind.

8. The following image is a hypothetical apartment house type where your parents live in a separate dwelling unit. You, your partner, and your children live in the two-bedroom unit next door, where you have a shared balcony and additional family space. You and your parents will live without any spatial interference. Do you think this lifestyle is acceptable? Is it feasible? If not, what part of it makes you think so?
: I would really like to live in a unit like this. I think having your parents nearby while keeping your privacy is ideal. So I think I would definitely live in a unit like this.

Nationality: Moroccan
Gender: Male
Age: 36

1. Do you live with your parents or alone?
: I live alone.

2. When did you move out of your parent's home?
: When I was 17

3. What do you find most disturbing when living with your parents? (Please give at least one example, preferably related to space, room size, sound insulation, privacy, etc.)
: I don't remember, but when I visit I don't find anything disturbing

4. What do you like about living with your parents?
: I only visit them, it's important to me to see them regularly.

5. What do you need most in your home space if you had to live with your parents? (such as balcony, bedroom, bathroom, living room, kitchen... etc.) Why are those spaces so essential for you?
: A private bedroom.

6. Which space at home do you think you can't share with your parents, and which room or space are you willing to use with them?
: Everything I can share

7. If you live with your parents, there are certain moments when you would like to be alone. What facilities would you most like to have near your home (café, library, gym, garden, etc.)? Or if there is any space in your home that can meet this purpose?
: A park

8. The following image is a hypothetical apartment house type where your parents live in a separate dwelling unit. You, your partner, and your children live in the two-bedroom unit next door, where you have a shared balcony and additional family space. You and your parents will live without any spatial interference. Do you think this lifestyle is acceptable? Is it feasible? If not, what part of it makes you think so?
: It's worth trying, it depends on the relationship between the partner and the parents

Nationality: Spanish
Gender: Female
Age: 29

1. Do you live with your parents or alone?
: I live with my parents.

2. When did you move out of your parent's home?
: Several times, but I came back a year ago

3. What do you find most disturbing when living with your parents? (Please give at least one example, preferably related to space, room size, sound insulation, privacy, etc.)
: Sharing common areas (tv, space). Doing things their way (it seems like it's the only way to do things). I don't usually bring friends over. It's a small place.

4. What do you like about living with your parents?
: Sharing what happens in life. Cooking. Price (we can't find cheap places to rent here). Looking after pets together. I can travel and not worry about the house at all.

5. What do you need most in your home space if you had to live with your parents? (such as balcony, bedroom, bathroom, living room, kitchen... etc.) Why are those spaces so essential for you?
: A room for me besides my bedroom. I need space to work, dance, do creativity stuff, in which I feel nobody is listening or seeing me.

6. Which space at home do you think you can't share with your parents, and which room or space are you willing to use with them?
: I can't share my bedroom. The rest is fine.

7. If you live with your parents, there are certain moments when you would like to be alone. What facilities would you most like to have near your home (café, library, gym, garden, etc.)? Or if there is any space in your home that can meet this purpose?
: I can use a room privately. But also having gardens nearby comes in handy

8. The following image is a hypothetical apartment house type where your parents live in a separate dwelling unit. You, your partner, and your children live in the two-bedroom unit next door, where you have a shared balcony and additional family space. You and your parents will live without any spatial interference. Do you think this lifestyle is acceptable? Is it feasible? If not, what part of it makes you think so?
: Yes, it is acceptable.

Nationality: German
Gender: Female
Age: 31

1. Do you live with your parents or alone?
: I live alone.

2. When did you move out of your parent's home?
: When I turned 20.

3. What do you find most disturbing when living with your parents? (Please give at least one example, preferably related to space, room size, sound insulation, privacy, etc.)
: It didn't feel disturbing. Maybe mostly sound insulation otherwise.

4. What do you like about living with your parents?
: I didn't have to think about preparing food or doing housholdtasks. I didn't have responsibilities like when living on myself.
Also emotional support from my family! Huge point!

5. What do you need most in your home space if you had to live with your parents? (such as balcony, bedroom, bathroom, living room, kitchen... etc.) Why are those spaces so essential for you?
: Temporary solution:
My own room with some privacy: Sounds insulation. Would be great if the room was bid enough to have a table to work creatively on. So if i didn't want to socialize i wouldn't have to. Bathroom closebye where people don't get bothered if i use it early or late. Basically not having to worry about trying to stay quiet all the time would be nice.
Long term solution:
My own studio maybe even with a small seperate bedroom. My own small bathroom and small kitchen.

6. Which space at home do you think you can't share with your parents, and which room or space are you willing to use with them?
: Temporary solution:
I don't want to share the bedroom. I can share a kitchen. Bathroom would be nice to have my own, but not necessary. Shared Livingroom is also nice.
Long term solution:
I want everything for my own but it doesn't have to be big. Maybe one of us has a bigger space (Livingroom/kitchen/bathtub/garden).

7. If you live with your parents, there are certain moments when you would like to be alone. What facilities would you most like to have near your home (café, library, gym, garden, etc.)? Or if there is any space in your home that can meet this purpose?
: My own room/space would provide space to be alone. Maybe a park or other nature closebye would be nice.

8. The following image is a hypothetical apartment house type where your parents live in a separate dwelling unit. You, your partner, and your children live in the two-bedroom unit next door, where you have a shared balcony and additional family space. You and your parents will live without any spatial interference. Do you think this lifestyle is acceptable? Is it feasible? If not, what part of it makes you think so?
: This looks great! Even for a long period of time!

Nationality: Dutch
Gender: Female
Age: 32

1. Do you live with your parents or alone?
: Alone/with my partner.

2. When did you move out of your parent's home?
: My mother moved out when I was 16. So I lived with my brother from that age. I moved into my first studio alone when I was 18.

3. What do you find most disturbing when living with your parents? (Please give at least one example, preferably related to space, room size, sound insulation, privacy, etc.)
: Lack of privacy I guess. I can't imagine living with either one of my parents, since it's 16 years ago. I will fill out this form pretending I wouldn't mind living with my parents, but actually I would never ever again.

4. What do you like about living with your parents?
: Not having to pay rent.

5. What do you need most in your home space if you had to live with your parents? (such as balcony, bedroom, bathroom, living room, kitchen... etc.) Why are those spaces so essential for you?
: A private bedroom and bathroom and distance between me and the other residents ;)

6. Which space at home do you think you can't share with your parents, and which room or space are you willing to use with them?
: I wouldn't share a bedroom or bathroom if I hd to live with them longer than a month. I would share a kitchen, outside areas and a living room.

7. If you live with your parents, there are certain moments when you would like to be alone. What facilities would you most like to have near your home (café, library, gym, garden, etc.)? Or if there is any space in your home that can meet this purpose?
: Café/bar and my friends. If my bedroom is big enough and has a balcony/private garden, that would be nice too.

8. The following image is a hypothetical apartment house type where your parents live in a separate dwelling unit. You, your partner, and your children live in the two-bedroom unit next door, where you have a shared balcony and additional family space. You and your parents will live without any spatial interference. Do you think this lifestyle is acceptable? Is it feasible? If not, what part of it makes you think so?
: I think it would be an option for families that choose this lifestyle. For me personally, I would not want to even live in the same street as my parents, so it depends on the relationship.
If I would have a nice relationship with my parents, I would still not choose this type of living, because I think I would feel overwhelmed easily and not be able to relax 100%.

Nationality: Dutch
Gender: Male
Age: 26

1. Do you live with your parents or alone?
: I live alone.

2. When did you move out of your parent's home?
: Age 21.

3. What do you find most disturbing when living with your parents? (Please give at least one example, preferably related to space, room size, sound insulation, privacy, etc.)
: Room quality and size were low (sound and heat isolation issues, small room, lack of innovation , (better internet connection in all rooms, not just theirs) lack of privacy, tired from travelling long distance to study & work by public transportation. Also patterns of parents and rules can be restrictive.

4. What do you like about living with your parents?
: No rent ($$$), larger living space, better location in city than gen z can afford, shared cooking and cleaning effort.

5. What do you need most in your home space if you had to live with your parents? (such as balcony, bedroom, bathroom, living room, kitchen... etc.) Why are those spaces so essential for you?
: Good heating and sound isolation, proper lighting, good curtains, desk, bed and chair space, bathroom, kitchen with cooking panels, living room with couch and tv. Important due to study/work/ privacy and life quality. Living room is nice since it will allow for a separate place for fun.

6. Which space at home do you think you can't share with your parents, and which room or space are you willing to use with them?
: Bedroom. Nice addition would be private bathroom. Willing to share living room, kitchen, bathroom, garden.

7. If you live with your parents, there are certain moments when you would like to be alone. What facilities would you most like to have near your home (café, library, gym, garden, etc.)? Or if there is any space in your home that can meet this purpose?
: Home cinema/gym would be nice, or home library. No space current.

8. The following image is a hypothetical apartment house type where your parents live in a separate dwelling unit. You, your partner, and your children live in the two-bedroom unit next door, where you have a shared balcony and additional family space. You and your parents will live without any spatial interference. Do you think this lifestyle is acceptable? Is it feasible? If not, what part of it makes you think so?
: Nice design but requires larger housing. Maybe if you stack apartments like this it might be more realistic. Land in the Netherlands is ridiculously priced.

Nationality: French
Gender: Male
Age: 27

1. Do you live with your parents or alone?
: I live alone.

2. When did you move out of your parent's home?
: Last year.

3. What do you find most disturbing when living with your parents? (Please give at least one example, preferably related to space, room size, sound insulation, privacy, etc.)
: When you take your girl friend at home, the daily schedule should be somehow the same as others.

4. What do you like about living with your parents?
: No rent

5. What do you need most in your home space if you had to live with your parents? (such as balcony, bedroom, bathroom, living room, kitchen... etc.) Why are those spaces so essential for you?
: Badroom, for privacy reason.

6. Which space at home do you think you can't share with your parents, and which room or space are you willing to use with them?
: Don't share: bedroom. Ok to share: kitchen.

7. If you live with your parents, there are certain moments when you would like to be alone. What facilities would you most like to have near your home (café, library, gym, garden, etc.)? Or if there is any space in your home that can meet this purpose?
: Still bedroom.

8. The following image is a hypothetical apartment house type where your parents live in a separate dwelling unit. You, your partner, and your children live in the two-bedroom unit next door, where you have a shared balcony and additional family space. You and your parents will live without any spatial interference. Do you think this lifestyle is acceptable? Is it feasible? If not, what part of it makes you think so?
: Is ok, but there to many curtain wall, not enough windows.

Nationality: Danish
Gender: Female
Age: 29

1. Do you live with your parents or alone?
: With boyfriend.

2. When did you move out of your parent's home?
: 21.

3. What do you find most disturbing when living with your parents? (Please give at least one example, preferably related to space, room size, sound insulation, privacy, etc.)
: Privacy in regards to having a relationship. Additionally, independence is a factor, living alone allows me to create my own daily routines and put together a home in the exact way I prefer.

4. What do you like about living with your parents?
: When living together we take care of each other. So my parent have taken care of me growing up, but as they get older there is a growing number of things I can do for them and help them with, which is very rewarding for all I think. Also there is an economic benefit of living together.

5. What do you need most in your home space if you had to live with your parents? (such as balcony, bedroom, bathroom, living room, kitchen... etc.) Why are those spaces so essential for you?
: For me separate bedrooms would be essential, for privacy reasons. I would like to have my own bathroom and kitchen, to still have the option of independence in the daily routines such as making food. In Denmark it is really quite uncommon to live together so I think I could best imagine a version where it is a combination of two small separate homes in one combined home so that the company can be chosen.

6. Which space at home do you think you can't share with your parents, and which room or space are you willing to use with them?
: I could not share a bedroom. Living room I could definitely share.

7. If you live with your parents, there are certain moments when you would like to be alone. What facilities would you most like to have near your home (café, library, gym, garden, etc.)? Or if there is any space in your home that can meet this purpose?
: A garden or park where you could take walks alone and together would be nice.

8. The following image is a hypothetical apartment house type where your parents live in a separate dwelling unit. You, your partner, and your children live in the two-bedroom unit next door, where you have a shared balcony and additional family space. You and your parents will live without any spatial interference. Do you think this lifestyle is acceptable? Is it feasible? If not, what part of it makes you think so?
: Yes I think this is a good way to do it, so that you have the option to be together but also have your separate life, a bit like described in previous answer.

Nationality: Dutch
Gender: Female
Age: 25

1. Do you live with your parents or alone?
: I live with two flatmates since a month, before that I lived with my parents.

2. When did you move out of your parent's home?
: A month ago.

3. What do you find most disturbing when living with your parents? (Please give at least one example, preferably related to space, room size, sound insulation, privacy, etc.)
: In general my relationship with my parents is very good, therefore I did not have many issues with them when I was still living at home. I had a bedroom in the attic and therefore a lot of privacy. I do feel there is a point for everyone when they reach a certain age that you prefer to have truly your own space where you can decide for yourself what to cook, when to clean etc. When you get older and more mature, the small things tend to bother you more quickly. It was mostly just about being able to make your own rules.

4. What do you like about living with your parents?
: When I lived with them they gave me a sense of stability. I knew when they would be home, I knew that they would be there when I needed to vent about stuff, for instance about study. It is nice to have that stability when during college your live can be quite chaotic. For me I always already did chores in the house from a young age onwards, so it wasn't that I liked living with my parents because they cooked and cleaned for me, I did those things as well.

5. What do you need most in your home space if you had to live with your parents? (such as balcony, bedroom, bathroom, living room, kitchen... etc.) Why are those spaces so essential for you?
: When living with your parents it would be nice to have a space that is very much your own. I didn't mind sharing a bathroom with them, but I can imagine when you get older, that would be nice. Especially when you get home later and they are for instance already asleep, it is nice to be able to shower/ use the toilet close to your own bedroom, so they would not wake up. Also, a balcony would be nice as well, so that you'd have your own private outdoor space as well.

6. Which space at home do you think you can't share with your parents, and which room or space are you willing to use with them?
: For me it is essential to have a space which would be just for me, so definitely a bedroom, but if you are older and living with them it would be nice for this space to be quite large, to fit a couch etc in there as well. This space I would definitely not share. I don't mind sharing a kitchen or bathroom and of course a dining/ living room area and garden. Especially the kitchen/ dining room for me would be the perfect place to share.

7. If you live with your parents, there are certain moments when you would like to be alone. What facilities would you most like to have near your home (café, library, gym, garden, etc.)? Or if there is any space in your home that can meet this purpose?
I can imagine a gym or other sport facility would be nice to have as your private space. For me personally my bedroom is my private space where my parents would not generally go without knocking. A garden is also nice to be able to have some time alone, but of course that would be accessible for them as well, but my parents respect my privacy when I'm for instance reading a book in the garden, they would leave me be.

8. The following image is a hypothetical apartment house type where your parents live in a separate dwelling unit. You, your partner, and your children live in the two-bedroom unit next door, where you have a shared balcony and additional family space. You and your parents will live without any spatial interference. Do you think this lifestyle is acceptable? Is it feasible? If not, what part of it makes you think so?

: I think it would definitely be acceptable. I can imagine nowadays, people grow older and live longer at their own homes. If your relationship with your parents is good, it would be nice to share space together to be able to have that connection. It always is good though to retain your own private space as well. In the floor plan at the moment I can only see the balcony as the shared space? Is this would be an indoor environment (like a second living room that if shared within the family), I would comment that I personally would not find ik ideal to have a bedroom directly connected to it, since I can imagine the adults would be there untill later in the evening and the two children would have their bedrooms directly connected to that space, maybe being bothered by the noise? But I definitely like the idea aof a shared space!

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