From the Faculty of Engineering of the
University of Duisburg-Essen,
Department of Civil Sciences
to obtain the academic degree of
Doctor of Engineering approved dissertation

Urban spaces for healthy aging –

model of a therapeutic agent

Medical evaluation of a

functional-therapeutic open space concept in

the *village – living in old age,*

Theodor Fliedner Foundation, Mülheim ad R.

Submitted by

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Date of the oral examination: April 17, 2015

short version

Urban spaces for healthy ageing is a cooperation model with actors from science, applied geriatric care management and the planning sector.

The interdisciplinary model is intended, against the background of demographic change, as the first dementia-friendly spatial study that shows the feasibility of putting *open or protected urban landscapes* into practice for people with dementia, people with mental age-related impairments and people with disabilities.

In the design of public space as *the lifeblood of infrastructure, urban* planning approaches have been pursued such as *milieu therapeutic social planning,* urban *Design* and *walkability* - pedestrian friendliness. The intention so far has been to counteract the increasing trend of urban space and town center desolation.

The project *Urban Spaces for a Healthy Age* as *a Model of a Therapeutic* was a further development of this strategy and demonstrates the future medical and therapeutic applicability of public space. It has been shown that open space planning, taking into account special planning criteria for spatial elderly and dementia friendliness, has the potential to be included in nursing science. This represents an opportunity to integrate urban space into outpatient care systems.

age-appropriate neighborhoods.

As the initiator and doctoral student, I planned and set up the entire study between 2011 and 2014, gained a network of cooperation partners for the model project and implemented the entire project. It is based on the design of a functional-therapeutic open space concept, the medical effectiveness of which was tested using psychiatric diagnostics on a group of residents with dementia within a neighborhood.

The concept consists of dementia-friendly building blocks of open space planning as well as an accompanying curriculum for the specialist areas of care management, occupational therapy and dementia care. It is based on the widespread idea within municipal planning and geriatrics that there are interrelations between building structure and care. This can have an impact on the health and performance of generations, which is even more important for the age-appropriate development of districts in the future.
should be investigated.

The following findings were obtained from this study:

1. Dementia-friendly open spaces have an antidepressant effect.

2. Dementia-friendly open spaces have a positive effect on affect, ie after using them, the resident's emotional arousal is qualitatively improved.

3. Test residents with dementia benefited from the use of the functional-therapeutic open space concept (a prototype) - according to statements by relatives.

4. The relatives of the test residents with dementia see the application of this concept as a therapeutic offer.

5. The model project *Urban Spaces for a Healthy Age* is seen by the relatives of the test residents with dementia as an enrichment for the age-appropriate neighborhood.

As a consequence, *demographically stable know-how for urban space management* should be considered by establishing interface projects between the construction and care sectors in order to release unused resources. One goal here is to create compact building structures and additional protected spaces and paths in inner city areas.

The next steps towards a dementia-friendly city center of the future would be

Further development of planning for demographics, the transfer of specialist knowledge from medicine and nursing science into urban planning and a strengthening of the nursing professions through the acquisition of free therapy rooms.

The result would be a qualitative and therapeutically effective improvement of the immediate living environment and the quality of life in old age.

thanksgiving

The interdisciplinary model project *Urban Spaces for a Healthy Age* began after the dissertation thesis on the medical evaluation of a functional-therapeutic open space concept was included in the structured doctoral program (ARUS) at the University of Duisburg-Essen. The Theodor Fliedner Foundation, Mülheim an der Ruhr, was able to be won over to set up the study site with the *Village - Living in Old Age* . The medical evaluation of the concept was carried out by the LVR-Klinikum Essen, Department of Psychiatry and Psychotherapy, University of Duisburg-Essen. The design and the

I developed and provided the construction planning for the open space prototype. A supplementary curriculum program for qualified nursing staff was implemented at the location by the therapists of ZAPP, the Center for Outdoor Space Design for People in Need of Care, Alfter near Bonn under my direction.

In addition, individual project phases were accompanied with great commitment until completion by doctoral students in geriatrics, research assistants, private individuals, volunteers, social service employees, district residents and patient relatives.

First of all, I would like to thank Prof. J. Alexander Schmidt as head of the Institute for
Urban Planning and Urban Development at the University of Duisburg-Essen. As the first assessor and mentor of the Arus program, he accompanied the model project with constructive and goal-oriented input throughout all project stages, so that the project could be pushed forward with great enthusiasm throughout.

I would also like to thank Prof. Rolf D. Hirsch for contributing his high level of technical expertise to the medical part of the application research as well as for his concrete, helpful opinions.

Special thanks go to Prof. Jens Wiltfang and his medical study team for their high-quality evaluation support at the test site. I would also like to mention Dr. Ute Fiedler, Dr. Bernhard W. Müller, Ms. Aneta Kozlowski, Ms. Ulrike Rehwald-Mohr and Mr. Daniel Vosswinkel, who addressed the study results separately with various medical questions and thus contributed to a new type of scientific collaboration between the scientific fields of urban planning and geriatrics. I would like to thank Ms. Meyer-Rötz for coordinating the medical evaluation at the test site and for her high level of personal commitment in compiling the data.

I would also like to thank Mr Uwe Wolfs from Dorf – Wohnen im Alter of the Theodor Fliedner Foundation, Mülheim ad R., for his outstanding willingness to cooperate as an actor in one of the most innovative senior care facilities in the district, as well as his employees – especially Ms Verena Moos – and the volunteers in his house.

Special thanks go to Ms. Petra Olligschläger, who played a key role in the realization of the project through her collaboration in the area of project support services.

I would also like to thank the ZAPP therapist team – Mike Speich, Dirk Meissner and Kristina
Budde – mention that in the project the villagers with specialist and long-standing

Experience in occupational therapy and dementia care. In this way, it contributed to the achievement of significant empirical results and a wide range of productive individual results with the overall study Urban Spaces for a Healthy Age.

I would especially like to thank all the people who showed interest in the various aspects of the 3½ years of research and thus contributed to a professional discourse on dementia that was able to extend beyond the scientific community into the public.

My general understanding of academic work has expanded with the interdisciplinary approach of my work. Although it became apparent that each discipline has its own methodological preference for academic work, I was happy to accept the challenge of promoting the methods of the individual disciplines in academic discourse. I did this because - after carefully familiarizing myself with the research methods of the individual disciplines - their advantages gradually became clear to me.

Based on my level of knowledge as a planner and medically and therapeutically trained person, I have decided on an interdisciplinary combination of methods and on the present structure of the work.

At this point I would like to thank the sponsors of the construction work, the Stiftung Wohlfahrtspflege NRW, the Deutsche Fernsehlotterie and the Theodor Fliedner Stiftung, as well as the Kuratorium Deutsche Altershilfe eV for their kind support of the training curriculum.

Alfter, June 8, 2015

Sonia Teimann

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short version

thanksgiving

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ATTACHMENT

1 Introduction

When considering the framework conditions for urban design processes with regard to
In response to demographic change, we are currently faced with several social
tendencies.

- Statistical model calculations up to the year 2060 show a decrease in the total German population with an increase in the older population share and an increase in individual life expectancy – assuming the rate of immigration remains the same.

- Since the 1970s and 1980s, sociology has been describing the phenomenon of pluralization and simultaneous individualization of society. • In addition, the latest social developments in Germany are making the
increase in age isolation and the socio-spatial separation of senior citizen groups increasingly clear.

- The increasing decline in families with standardized household and family structures and the increased employment of women mean that the accommodation and care of older people is being shifted from the private to the professional sector. Current social policy efforts are major in order to be able to secure the economic basis of this sector for the future.

As a major consequence, demographic change in Germany will have an impact on the
Financing of health and care systems, the socio-political organizability
heterogeneous social groups and on public social life in urban space
The need for a new spatial planning within urban development is becoming increasingly
the future population-related age shift. The *demographic*
Change is discussed in detail in the introduction to this dissertation.
In this context, a cross-departmental approach is an opportunity for practical
everyday life of the people in the district. The field of urban planning is in the
Location, interdisciplinary - in interaction with other disciplines - such as geriatrics,
to set new course for the contemporary transformation of urban space. Urban planning is
able to take into account the trends described above and to develop new age-appropriate and
to implement demographically stable concepts in our neighborhoods in a structural, constructional and logistical manner.
If we were to start today with building projects following an innovative
planning system that is suitable for seniors, the next ageing generation
the baby boomers (born between 1955 and 1969) of interdisciplinary cooperation models
urban development and geriatrics in a sustainable manner.

After considering this initial urban development situation, it is now necessary to
urban planning and geriatric model study to answer 3 questions:

1. Does the planning of open spaces in the neighbourhood have a positive psycho-social effect on the quality of life? and living conditions of people with dementia?

2. Is the health-promoting effect of public space for the elderly with dementia
empirically verifiable?

3. Is there a method for identifying dementia-friendly planning elements?

The main basis of the dissertation was the perception and orientation performance
in dementia in the room in an overview. This is to be considered a new achievement, since
the connection between space, dementia and health has not yet been
Based on this, the test site *The Village – Living in the*
Alter of the Theodor Fliedner Foundation in its urban development form with regard to the *elderly and dementia friendliness* were qualitatively assessed.

The main subject of the dissertation is the medical evaluation of a
functional-therapeutic free space concept (non-medicinal treatment measure
Dementia Garden). This was tested on 61 test subjects with dementia over 6 months and the
Health status of the test subjects over the period of *dementia garden application*
medically examined. Using an urban planning approach to memory and
Orientation ability in dementia, a newly developed method (3-D Cognitive-
Mapping). It was examined whether open space objects contribute to spatial memory and
Finally, the effectiveness of the measure was
Dementia garden in the neighborhood was determined based on a survey of relatives.

1.1 Structure of the work

The introduction of this dissertation *Urban Spaces for Healthy Ageing* leads with
Chapter 1.2 *(Demographic Change)* examines the causes of the social old-young divide.
Shift in the near future. In particular, the aspects of
Health in old age and the social significance of old age and dementia as well as
the associated challenges for urban planning regulation efforts
highlighted.

Chapter 1.3 *(Research questions of the urban planning and geriatric model study)* presents the Objectives, hypotheses and methods of this research approach are presented. In addition, the interdisciplinary approaches of the four cooperating departments *of urban planning, Geriatrics, site practice* and *project planning* are explained.

In Chapter 2, the syndrome of dementia as a symptom complex and its Epidemiology, diagnostic criteria and main forms are discussed.

Chapter 3 *(Space – Dementia – Health)* gives a complete overview of the still existing neurological perception abilities of dementia patients during It also provides insight into the current state of knowledge about the extent to which structural space has a compensatory significance. Questions such as which orientation, perception and mobility skills the dementia patient can rely on during the illness or what support the built environment for neurologically impaired people and those suffering from dementia offers, answers.

The presentation of the previously implemented *spaces for dementia and Alzheimer's dementia* is given in Chapter 4. In this context, the focus was on the orientation and decision-making level and the cognitive demands when walking in open spaces The chapter ends with a comparison of the application of 6 open space typologies in Regarding the severity of dementia.

Chapter 5 classifies the test site in its urban development characteristics and evaluates the quality of its friendliness for the elderly and dementia in 3 levels.

The experimental object, the functional therapeutic open space concept in the form of a *Dementia garden,* is presented in Chapter 6 with its theoretical planning principles and Implementation elements used during the intervention phase are listed.

Chapter 7 explains the interdisciplinary data collection and analysis.

Chapter 8 contains the individual results for the analysis of the mood of those affected, the physical and social boundary conditions, the review and application of the 3-D-Cognitive Mappings and family member satisfaction.

Chapter 9 contains the summary and Chapter 10 presents the conclusion. Overall result of the dissertation in the overall scientific context.

1.2 Demographic change

1.2.1 Shift in the old-young ratio

In order to highlight the significant changes within the German population,
The report deals with aspects of demography that are expected to cause a new
The 12th population forecast of the
Federal Statistical Office relies on calculations from the individual state statistical offices
and takes into account the population dynamic processes. This forecast
allows at the given time to foreseeable long-term and stable demographic
developments up to the year 2060. The following statistics are included in this report
taken and concretized the extent of change with reference to the
Total population, average population age, life expectancy,
birth rate and age-related employment structure.

Population decline of up to 21% possible

The year 2003 was the first time that a population decline was recorded in Germany, at a level of around 82 million people.1 By 2012, this level had fallen further to 80.5 million.2 This trend will continue and the Statistical
Based on its calculated scenarios, the Federal Office assumes that in 2060 the
expected total population will be between 65 million and 77 million – depending
after the development in the area of birth rate and immigration. On this calculated basis, a population decline of up to 21% would be possible by then.3

Increase in the median population age from 43 to 52 years

The future age-related demographic shift trend will be most evident in
a comparison of the group of very old people (80 years and older) and the group of
under 20 years of age. The number of very old people is expected to increase from 4 million to 9 million between 2008 and 2060.
million. This means a percentage increase in the total population
from 5% to 14%. Meanwhile, the group of under 20-year-olds is made up of around 16 million
to 10 million, which corresponds to a reduction from 19% to 16%. In addition
The age group between 20 and 65 years will shrink as the number of people under 50
will decrease.

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[1] Federal Statistical Office (2009), p. 12.
[2] See Internet service of the Federal Statistical Office, www.destatis.de, URL: https://
www.destatis.de/DE/ZahlenFakten/GesellschaftStaat/Bevoelkerung/Bevoelkerungsstand/Bevoelkerungsstand
.html%20mb165 (June 6, 2014, 2:20 p.m.).
[3] Federal Statistical Office (2009), p. 12.

In 2008, a 43-year-old reached the average age of all Germans. In
Between 2045 and 2060, half of the German population will be older than 52 years.4

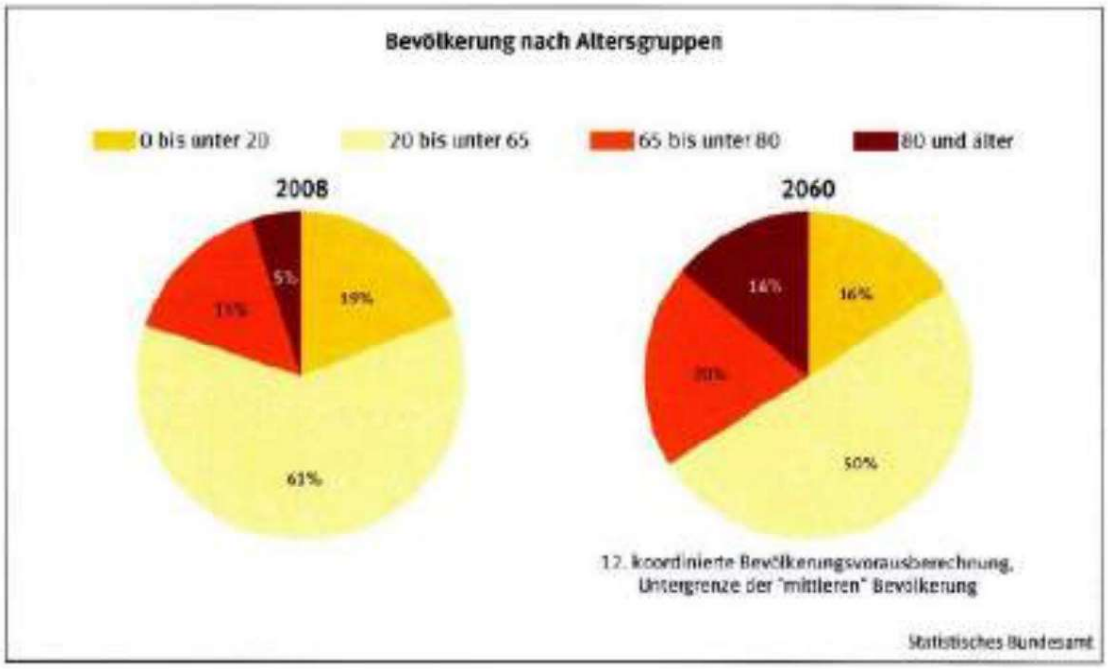

Figure 1. German population in age groups in 2008 and 2060 in percent.
Source: Federal Statistical Office (2009)

birth rate between 1.2 and 1.6 children per woman

The current level is 1.4 children per woman. The birth rate is closely related to
political decisions regarding the development of parental allowance and the situation
of childcare. In addition to the predictability of economic provision
The overall societal attitude towards the concept of family life will also be
crucial role. For this reason, three different
Birth rate variants for the year are given. This results in birth rates of 1.2/1.4/1.6 children per woman.5 Regarding childlessness, it should be noted that the
The proportion of women who remained childless – comparing the 1930 and 1960 cohorts – has almost doubled from 11% to 21%.6

[4] Federal Statistical Office (2009), p. 16.
[5] Federal Statistical Office (2009), p. 27.
[6] Ibid., p. 26.

Increasing life expectancy – to an average of 88.4 years by 2060

Life expectancy has increased steadily over the last 130 years. The reasons for this are
Advances in healthcare, hygiene, medical standards and
Improvements in living conditions, accident prevention and occupational safety.
From 1871 to 1881, a 60-year-old could expect to live an average of 12.1 additional years.
Today, the additional life expectancy for him has reached an average of 21.1 years.
The Federal Statistical Office states that life expectancy will continue to increase in the future
This means that in 2060, men aged 60 would have an average of 26.6 more years to live and
women of the same age an average of 30.1 more years to live.7

Figure 2. Life expectancy at age 60 by sex, 1871 to 2060.

Source: Federal Office for Civic Education according to the Federal Statistical Office (2014).

Drastic age-related shift within employment to "50 years and older".

For the economy, but also for the future financing of health and
The age cohorts of the working population are of great relevance for long-term care insurance systems.
The number of people of working age between 20 and 65 will fall dramatically.
From an average of 50 million people today, this number will fall to 36 million people in 2060.
That is 27% less than today.8

[7] See BPB (2014).
[8] Federal Statistical Office (2009), p. 17.

In addition, between 2017 and 2024 there will be as many employed people in the 50 to 64-year-olds and the 30- to 50-year-old group: 40% each measured by
This is due to the increase in the number of people over 50 years of age expected by 2060.9 The combination of these factors will
lead to fewer and fewer middle-aged workers being available for the education system of the boys and the state health, pension and care systems
become.

Care needs – an increase rate of 100% possible by 2050

The number of people in need of care will increase from 2.25 million in 2007 to up to 4.5 million in 2050. This estimate, which is based on the most negative development, predicts a doubling of cases.10 The majority of the needs of benefit recipients of the
Nursing care insurance is currently 68% financed by informal care provided by women in the family environment; often accompanied by the use of nursing services. 32% of those affected are cared for in homes.11 In 2002, the average age of
Age at which men entered nursing home was 78.9 years and age at which women were 82.4 years. [12]

1.2.2 Costs of health, care and dementia

According to DESTATIS, the Internet service of the Federal Statistical Office, the
Health expenditure in Germany rose for the first time in 2012 to 300.4 billion euros.
They were 6.9 billion euros or 2.3% higher than in 2011. This means that each inhabitant received a good 3,740 euros, while in 2011 it was 3,660 euros.13
As in the previous year, the (part-)inpatient sector accounted for 37% of the total
Health expenditure. Here, expenditure rose by 2.8 billion euros or 2.6% to 110.3 billion euros. The most important (part-)inpatient facilities14 were the
Hospitals (+ 2.5% to 78.8 billion euros), followed by the facilities of the

[9] Ibid., p. 18.
[10] Federal Statistical Office (2010), p. 30.
[11] Ibid., p. 21.
[12] See Federal Statistical Office (2007).
[13] See http://www.destatis.de
URL: https://www.destatis.de/DE/ ZahlenFakten/GesellschaftStaat/Gesundheit/Gesundheitsspenden/Aktuell.html (May 20, 2014, 2:21 p.m.).
[14] (Partly) inpatient means the admission of a patient to a care facility for a period of less than 24 hours; usually during the day within a certain time frame.

(partial) inpatient care (+ 2.5% to 22.8 billion euros) and preventive and rehabilitation facilities with 8.7 billion euros (+ 4.0%).15

In 2012, 430,000 people received financial support for care. This was a percentage increase of recipients of 3.8% compared to the previous year. Let us look at the Gender distribution, women were significantly older with an average age of 79 years than male benefit recipients with 68 years.16 The Dementia Report of the Berlin Institute for Population and Development reports the cost of dementia to the economy in 2008 with 9.5 billion euros. It is also emphasized that, since

> "[...] when the costs of illness were recorded for the first time in 2002, the expenditure on dementia and depression together increased twice as much as the total costs. If we assume that there are 1.3 million people with dementia in Germany, each person spends 7,200 euros annually on treatment and care."17

1.2.3 Ageing health, social differentiation and life satisfaction

At this point, it should not be forgotten that the physical and psychological Health is related to socioeconomic status and educational level. The fact that different living and working conditions have a direct influence on the health and the effects of these accumulate in old age, more and more This is referred to as socially differentiated morbidity. Evidence for this can be found with regard to the relationships between social class and the medical, cardiovascular risk model, for example, in smokers and overweight people.18 Furthermore, the ADL measurement (Instrumental Activities of Daily Living/Measurement of Everyday Competence)19 shows that members of the upper middle class are are classified as less in need of help. Higher education, higher social prestige and the presence of a partner in the household is linked to better physical mobility.20

In the large-scale and regularly conducted Berlin Age Study by the Berlin-Brandenburg Academy of Sciences MEYER/WAGNER21 see such central Dimensions of social participation depending on, among other things,

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[15] See www.destatis.de; press release of 7 April 2014-126/14.
[16] See www.destatis.de; press release of 11 February 2014-043/14.
[17] Berlin Institute for Population and Development (2011), p. 52.
[18] Mayer/Wagner (1999), p. 268.
[19] ADL = Activities of Daily Living (ADL), which refers to 12 activities of daily living. URL: http://de.wikipedia.org/wiki/Aktivit%C3%A4ten_des_t%C3%A4glichen_Lebens (26.05.2014, 10:44h).

[20] See Mayer/Wagner (1999).
[21] Ibid. (1999).

Social class and level of education. For example, social activities, political
Interest and voter turnout, especially among the semi-skilled workers, is relatively
low level; however, especially among the very old, a high level of education is important for the
promoting participation outside the home.

In this large-scale Berlin study, SMITH et al. conducted measurements of the subjective
well-being in old age. According to age cohort and different social subgroups
The statements of 516 participants from 6 age groups were recorded. Here the
Well-being in old age is examined in more detail in order to make predictions based on objective
Living conditions and subjective evaluation. The well-being was assessed in 4
Categories measured: *current life satisfaction, satisfaction with past*
Life, future life satisfaction and *general well-being.*

With regard to a positive mood, the following significant differences emerged
out (order by weighting):

1. Living situation,
2nd age group and
3. Marital status.

The very old and the nursing home residents reported a low level of satisfaction, with
It was noticeable that women reported negative feelings more often. The respondents
The high weighting of the housing situation gives reason to improve the spatial conditions for older
to examine people more closely using psychometric measurement methods in order to improve living
conditions in this regard.[22]

[22] See Smith et al. (1999).

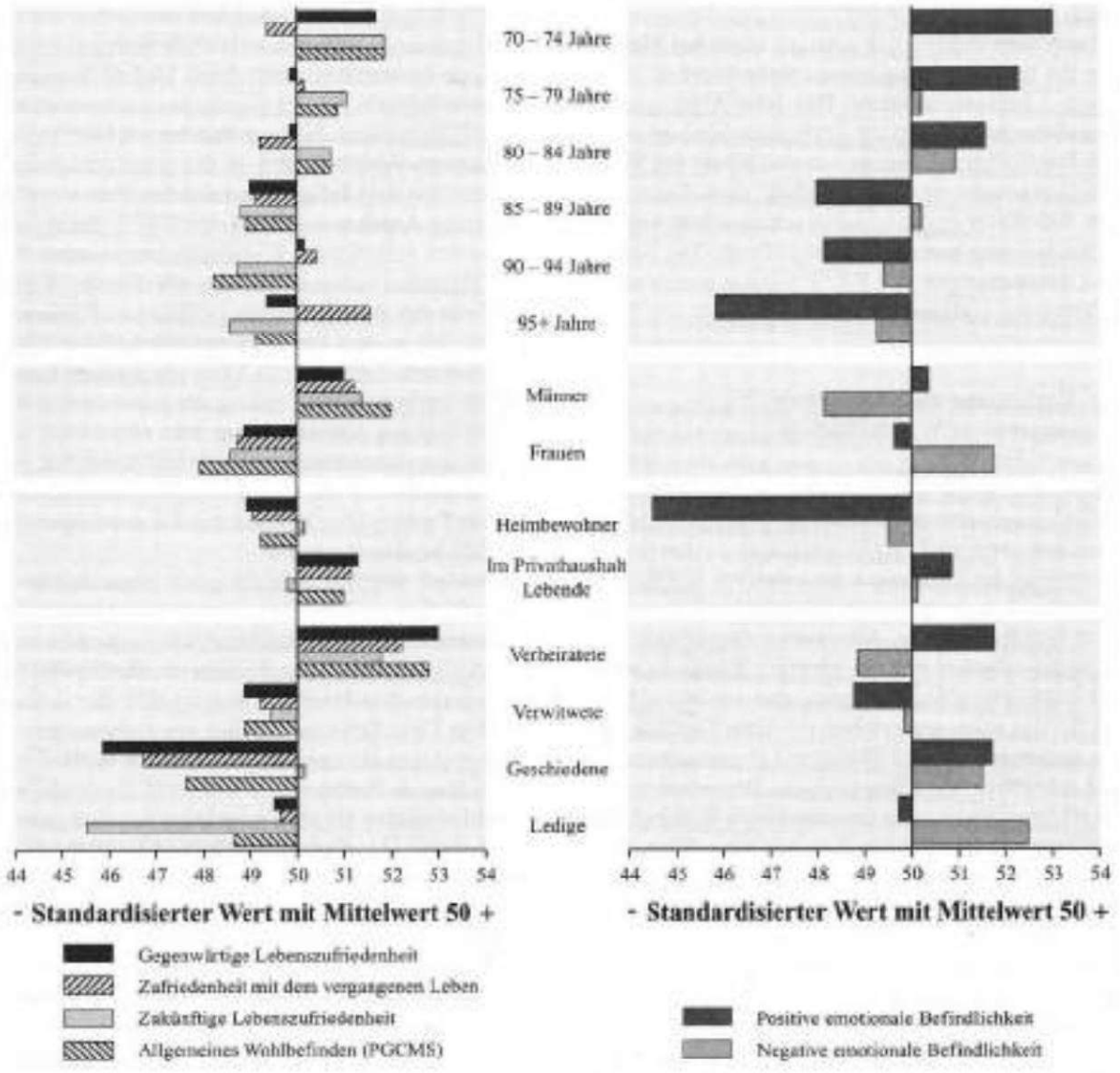

Figure 3. Comparison of age subgroups in different dimensions of subjective well-being, life satisfaction and emotional well-being;PGCMS = Philadelphia Geriatric Center Morale Scale.
Source: Smith et al. (1999)

1.2.4 A perspective on the changing concept of age

The predominant debate on demographic change has taken place
mainly with regard to regulation and adaptation of state-supported
Financing models that cover long-term care insurance, retirement age and
The question for the future will be: “Will the
de facto numerical change in the social age structure also leads to a
Change in awareness in dealing with these challenges facing society as a whole?"
The public, but also the scientific, engagement with demographic change
is based on the consistent image of a threatening *flood of elderly people* and thus on a non-

burden of care to be managed, an ever-increasing probability of being at the mercy of
dementia and a historically fateful and unjust financial disadvantage
of the boys due to the leak in the state coffers.

Not only the updating of the existing generational contract of the solidarity community as
economic allocation system must be reconsidered, but also a new,
A value-based model for the interaction between generations must be developed.
In this context, there are already fundamental theoretical debates within the
Humanities. In this discourse, there is already increasing resistance from the
practical philosophy and ethics against the use of the terms *ageing society, ageing* and *the burden of old age.*

According to HÖFFE, the term *ageing society* is misleading, as it implies an inevitable
In addition, it presupposes a fixed age limit, which
is based on an external, calendar age, but not on the actual lived age – the
biological, emotional and mental age. The determination of a
numerical age, which would be around 60, 65 or 70 years. The significantly improved condition of the elderly and their
increasing life expectancy would not be taken into account.23
The demand is to discover the potential of old age: as a late phase of life
between vitality and finiteness.

The basis for happy aging would be to utilize age potential
for society as a whole, in the sense of intergenerational justice and
a deeper understanding of individual biographical contexts. These include
Characteristics understood as composure and ability to distance oneself, age-coolness,
Resources in the face of experienced borderline situations and possession of authentic values
and an understanding of life that goes beyond one's own biographical and temporal limitations
What is seen here from a philosophical ethical perspective of today's zeitgeist as a
The solution to the demographic dilemma is an integral part of an 8-stage
Model of the psychosocial development of the individual, which the late
Psychoanalyst Erik Homburger Erikson developed. It is the penultimate and seventh stage
maturation or development in the field of tension between the changing requirements of
social environment. It is described as a stage of *generativity vs. stagnation and self-absorption*
designated.

[23] See Höffe (2013).

> "I am what I am willing to give […] what might be useful for future generations [without exhausting my individual resources]."24

This psychological development of self and identity throughout life ends after Erikson in the eighth and final stage – *integrity vs. despair* (mature adulthood): "I am what I have acquired."[25]

If a balanced life assessment is successfully carried out at this stage, it is possible life without disgust for oneself and other people and an unconscious fear of death to be able to see.

1.2.5 Dementia as a dimension of spatial dependence

This last positive effect as a form of social participation naturally requires to be mobile, physically agile and not too cognitively impaired. Dementia as an incurable disease clouds the image of a contented, worth living and still effective last phase of life. These worries about the external The dignity granted in old age and the suffering of death characterizes the current social In 2012, the German Ethics Council, which also includes representatives of the Church institutions are represented, in a publication the feeling of existence among Dementia and possibilities and limits of nursing feasibility in relation to Self-determination or restrictions on freedom. It is emphasized that the dimension the dependence of the affected person on the environment is particularly great here.[26] Questions such as whether there are still opportunities for personal development and Freedom of movement that allows for self-determination and correspond to the personal self-perception or whether there are possibilities for co-decision regarding the living situation are on the table.

The German Ethics Council advocates that the recognition of human rights with dementia and ensuring their social inclusion should be based on the principles of the UN Convention on the Rights of Persons with Disabilities.27

Article 14 on the *freedom and security of the person* of the Convention states that people with Disability in the event of deprivation of liberty shall be subject to the same procedural rules and

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[24] See URL: http://de.wikipedia.org/wiki/Stufenmodell_der_psychosocialen_entwicklung (May 20, 2014, 2:21 p.m.).
[25] See ibid.
[26] See German Ethics Council (2012).
[27] See Convention on the Rights of Persons with Disabilities of 13 December 2006. Translation agreed between Germany, Liechtenstein , Austria and Switzerland URL: http://www.institut-fuer-menschenrechte.de/fileadmin/user_upload/PDF-dateien/Pakte_Konventionen/CRPD_behindertenrechtskonvention/crpd_b_de.pdf (20.05.2014, 14:21h).

have the same right to treatment by state bodies as all other
members of society. This particularly concerns the increase in freedom-restricting
Measures, in particular the application of mechanical measures and administration
sedative medications.

According to Article 19 entitled *Independent living and inclusion in the*
Community, the person concerned has the freedom to choose his or her place of residence, the respective form of housing
and support services as well as unhindered access to community-based
support services. Furthermore, the *right to personal mobility* is enshrined in Article 20
The Contracting States undertake to take effective measures for people
with disabilities to personal mobility with the greatest possible independence
This includes, among others, a) the mobility of people with
disabilities affordable, b) access to high-quality
mobility aids and assistive technology and c) professionals who are
to provide training to those affected.

In the balancing process, these Convention guidelines (in particular Article 14) in the final
The German Ethics Council is committed to implementing the principle of consistency locally in the municipalities – with regard to
People with dementia – adopt the following attitude:

> "[...] [This] would in particular exclude stays in a home against the will of those affected, even if this is done for cost reasons. However, it would also include the very important right to an assistant [...]. Furthermore, the application of this article would lead to the development of dementia-friendly services in the community, which could greatly facilitate the lives of those affected and their relatives and general coexistence. The implementation of this
> Putting this into practice requires considerable but also worthwhile efforts."[28]

1.2.6 Current development trends in age-appropriate housing

In the last 10 years, a new development has emerged in the field of age- and
dementia-friendly housing in the municipalities and respective districts in connection with
Health and care provision on site. A significant part of this has been
Senior and Alzheimer associations, church organizations and private individuals have contributed to the development of new
alternative forms of housing in the sense of *communal living* or *other*
In the beginning, these cooperative *communities*
together with partners from the housing industry, we have sought ways and means to develop new structural
To develop concepts for housing and, in part with the support of local political
to implement and manage structures.

[28] German Ethics Council (2012), p. 96.

As far as general housing needs are concerned, there is a clear trend that
Seniors prefer to live in their *own four walls29* and their relatives
Accommodation of those affected in traditional forms of housing such as nursing homes, assisted
Housing or service housing, residential homes or residences often only as a last resort
A gradual generational change within the group of the elderly is certainly also
One reason for the housing trend reversal and increasing acceptance of slowly
to turn to the newly developing *communal living .* These include
Multi-generational living, age-homogeneous house communities, dementia shared apartments and
Senior citizens' meeting places as well as mixed forms in the architectural construction implementation.
What is also becoming apparent is a high popularity of these projects among customers
or future residents and that more and more actors in the housing industry, but
also the church sponsors, to present such projects to the cities and municipalities – despite
or precisely because of the high level of self-determination and co-determination rights of those involved. [30]

In view of these civil society-initiated efforts based on the *bottom-up principle*
individual countries have now decided to give impetus to this development,
e.g. through stimulating information events, regulatory financing and
Credit programs and digital networking and information forms for local actors.31 They do this with
an increasing media and internet presence.
Lighthouse projects with imitation character for municipalities with structurally
similar framework conditions.

Results of the research project *Living in Old Age* of the Federal Ministry of Transport, Building
and urban development show that the new, community-based
Housing forms in the overall comparison only account for 0.1% compared to all housing forms in old age
The majority of the elderly population lives in normal apartments, 93 %.32

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[29] BMFSFJ (2006), p. 7.
[30] See Jansen (2009).
[31] See State Office for Senior-Friendly Neighborhoods NRW. New Ways of Neighborhood Development.
Workshops, December 9, 2013–January 17, 2014.
URL: www.aq-nrw.de and Schulz (2009).
[32] See Federal Ministry of Transport, Building and Urban Development (2011).

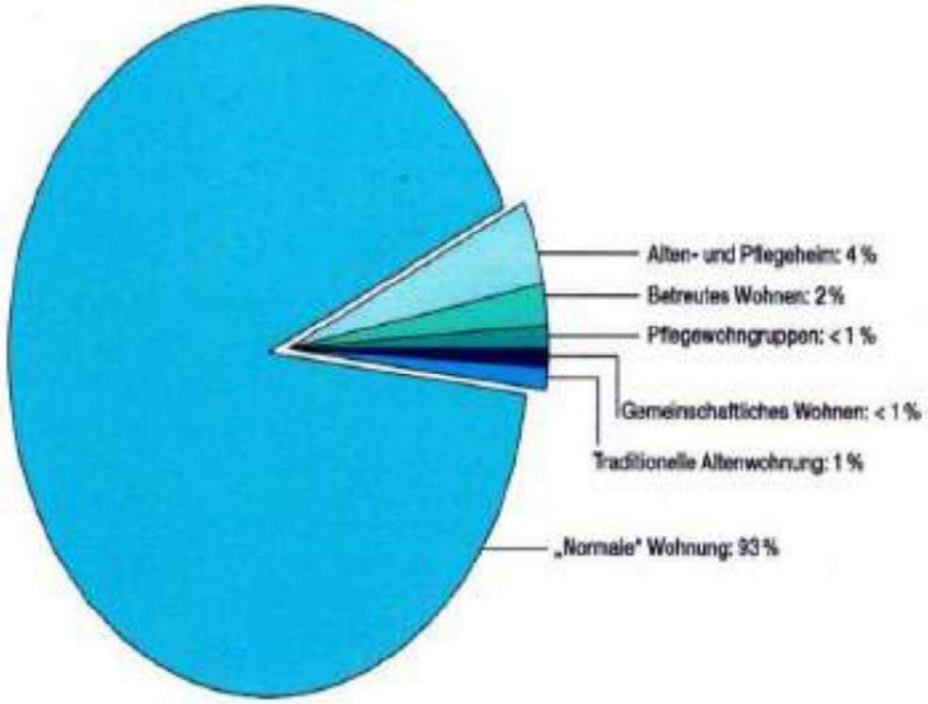

Figure 4. Percentage distribution of housing types in old age (65 years and older).
Source: Federal Association of German Housing and Real Estate Entrepreneurs (2008)

The study *Possibilities and Limits of Independent Living in Private Households,* a
Dementia research project of the BMFSFJ, examined the situation of home care with
The aim is to provide information on the redesign of care arrangements and the further development of new
3,622 people in need of care and assistance were
A key finding was that the assistance provided to
People in need of care of all levels of severity in private households on average for more than 8 years
and 92% of those in need of care receive help from their family or social environment
The apartment and living environment are important factors for quality care.33 Surveys in
2006 regarding the ownership structure showed a
Home ownership rate among senior households was 48%. This was 7% higher than the
national average.34 This gave rise to the structural
Promotion of private housing adaptations35, with a view to the regulations of the

[33] BMFSFJ (2006), p. 7.
[34] Federal Ministry of Transport, Building and Urban Development (2011), p. 29.
[35] See Kuratorium Deutsche Altershilfe (2007) and Federal Ministry of Transport, Building and Urban Development (2010).

barrier-free construction36, which are not yet binding for private housing construction. They were coupled with financial housing support for private individuals.

In this context, the definition of *age-appropriate housing* was urban planning and socially defined as follows and at the same time understood as a minimum requirement:

Attempt to define *building for age-appropriate living37*

1. No more than 3 steps to the house or apartment entrance (or technical aids to overcome the barriers).
2. No steps within the apartment (or technical aids to overcome the barriers).
3. Sufficient movement space and door widths in the sanitary area.
4. Presence of a floor-level shower.

If we start from this structurally necessary level of restructuring and consider care for the elderly in the home environment, statistical surveys show that only 7% of the senior households meet the conditions of a barrier-free/reduced apartment and that there are currently 2.5 million senior households, some of which face significant barriers within the apartments and do not provide barrier-free access to the apartment.38

urban context

According to the German Ageing Survey (DEAS)39, a large proportion of senior citizens stated to live in housing units with unfavorable locations. Around two thirds said they lived in peripheral areas or to live outside of towns. Only about a third of the apartments are located of older and owner-occupiers near the city center or in the town center. Half of the tenants live in the cheaper locations.

It is also stated that when discussing the need for action in housing policy Housing construction should not be viewed as an isolated task.

An age-appropriate apartment alone cannot always ensure independent living What is needed is a barrier-free/reduced living environment with local

[36] See Zeleny (2008).
[37] Federal Ministry of Transport, Building and Urban Development (2011), p. 25.
[38] Ibid., p. 51.
[39] BMFSFJ (2012), p. 51.

Infrastructure as well as counseling, assistance and care services that need to be coordinated at a small-scale level in the district.40

When it comes to housing policy, we are faced with several structural obstacles which the continuity of regulatory mechanisms after the *top-down principle* more difficult.

Obstacles to urban planning regulatory mechanisms

1. The willingness of private owners to invest only minimally covers the construction conversion needs.
2. Binding legal requirements that ensure a competitive real estate supply for Seniors are criticized by the housing industry.
3. From the customer's perspective, there is a lack of quality assurance and transparency.
4. Barrier-free construction is required in all countries for the public sector and for special groups of people, but is not a binding, uniform regulation for the normal housing construction. The partial regulations for barrier-free construction are inconsistently defined in the respective state building regulations.
5. Despite existing funding instruments, age-appropriate renovation measures are not implemented in implemented to a sufficient extent.

It can be stated that the results of the current regulatory measures will only become apparent in the coming decades. These are also to be seen against the background of Implementation efforts of the UN Convention Guidelines on the Rights of Persons with Disabilities, their inclusion and a higher planning order of the human The fact that the technical regulations for barrier-free construction in public spaces and public buildings for people with walking disabilities and other impaired persons, but also cost-realistic for the Construction industry can only be a first step: towards more Participation of seniors and people with disabilities in public spaces and dementia-friendly cities.

[40] Federal Ministry of Transport, Building and Urban Development (2011), p. 13.

1.3 Research questions of the urban planning and geriatric model study

1.3.1 Objectives

In recent years, there have been joint efforts in Germany by nursing home construction and of senior citizens' associations, concepts for housing structures within the outpatient and inpatient To further develop and scientifically evaluate the provision of care. This was done with the aim of to improve the quality of life and health of people with dementia in their immediate living environment.41 Since residential structures inside and outside in

There are large differences in their characteristics and number of inhabitants, it has not been possible possible to establish established procedures and metrics for evaluating the health status of Residents in the context of a quantitative research activity. In previous studies dealing with living arrangements as part of milieu therapy42 , the
Experimental design of the applied methods to the social and structural framework conditions of the test site.

In the study *Urban Spaces for Healthy Aging* (UDE) – a medical evaluation of a functional therapeutic open space concept in the *village - Living in old age* of the Theodor-Fliedner Foundation (TFS), Mülheim ad R. – an interdisciplinary methodological approach is chosen. By including the test site, the aim was to create the largest possible data pool, which the influence of space on an individual with dementia. See Figure 5.
At the same time, this approach is applicable for further multicenter43 studies.

With the establishment and review of a functional therapeutic open space concept, For the first time, a broadband test setting was developed in a district with which the The collected raw data are theoretically researched in two disciplines – urban planning and Geriatrics – were evaluated. A dementia outdoor facility (1 300 m²) was built here in Macrospace (64 000 m²) of a village settlement structure as a new landscape area After an application and intervention phase of 6 months, its
Efficacy tested on 59 people with dementia.

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[41] For example, “Evaluation of the potential in the care and support of people with dementia in house and shared accommodation through the application of benchmarking processes (2008-2010)”, a project of the Lighthouse Dementia Initiative of the Federal Ministry of Health, URL: http://www.kda.de/leuchtturm.html (08.05.2014, 11:40 h).

[42] Milieu therapy means: a shared therapeutic process within the framework of a temporary living community. In geriatrics, milieu therapy means the adaptation of the material and social environment to the changed perception, sensation and competencies of demented patients.
URL: http://de.wikipedia.org/wiki/Milieutherapie (May 8, 2014, 11:40 a.m.).

[43] Multicentric means: a clinical study that is conducted (nationally or internationally) in a large number of institutions is carried out. URL: http://de.wikipedia.org/wiki/Multicentric (08.05.2014, 11:40 h).

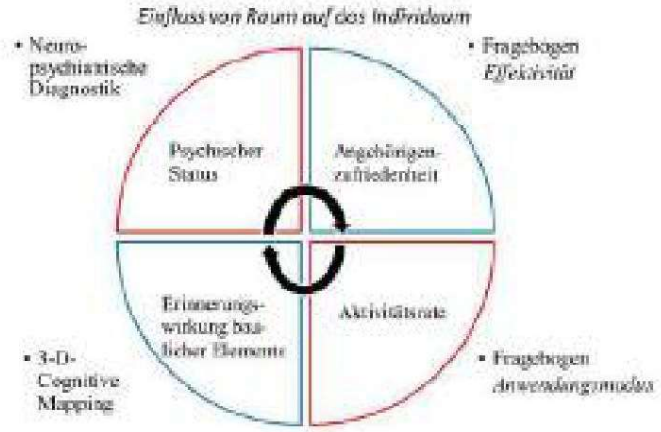

Figure 5. Interdisciplinary combination of methods to test the effectiveness of a spatial concept for dementia (blue = urban planning approach/ red = geriatric approach).
Source: Teimann

A. Review of a practice-oriented open space concept

Step 1: Construction of a dementia-friendly outdoor area in further development of the existing dementia gardens

Step 2: Training of qualified specialists

B. Quantitative analysis in the context of field research – laboratory conditions

Step 3: Neuropsychiatric diagnostics: General motivational constitution and psychological well-being in Regarding mobility and duration of time spent outdoors

Step 4: Urban planning studies: Behavioral observations in the space using video monitoring and Retrieval of memory performance in relation to activity patterns and directions in space

1.3.2 Hypotheses

Individual positive physical and psychological effects through staying in urban recreational areas, small-scale settlement and therapy gardens have already been documented through behavioural observations and experience reports[44] , but neuropsychiatrically not yet empirically validated. The current state of research is presented in Chapter *3.4.2 (Open spaces as sensory and social stimulus)* and in Chapter 4 *(Open spaces for dementia and Alzheimer's dementia) .*

From this starting point, 4 hypotheses blocks with differentiated Sub-hypotheses:

[44] See Stigsdotter/Grahn (2002), Pollock (2007) and Beckwith (1997).

MOOD OF THE AFFECTED / DEPRESSIVE

- **H1.1:** Spending time in dementia-friendly open spaces leads to an improvement in depression among residents with dementia in the neighborhood.
- **H1.2:** Spending time in dementia-friendly open spaces has a positive influence on affect[45] among residents with dementia in the neighborhood.

PHYSICAL AND SOCIAL CONDITIONS

- **H2.1:** A short distance from the home to the dementia garden increases the duration of use.
- **H2.2:** The level of air temperature has an influence on the service life.
- **H2.3:** The level of humidity has an influence on the service life.
- **H2.4:** Social activities in the dementia garden increase the duration of use.

REVIEW AND APPLICATION OF 3D COGNITIVE MAPPING

- **H3.1:** The memory performance regarding spatial objects in 3D cognitive mapping shows a correlation with the degree of cognitive decline.
- **H3.2:** Memory performance in 3D cognitive mapping differs with respect to individual objects.

RELATIVE SATISFACTION

- **H4:** Dementia-friendly outdoor facilities increase family satisfaction.

1.3.3 Methods

The study is a monocentric[46] study of applied research in
Field test. For the implementation of the spatial concept as a geriatric urban planning
measure of non-pharmacological dementia treatment was a positive ethics vote
Prerequisite. Participation in the study was voluntary and required the consent of the
relatives of the subjects. The garden built for this study is
functional therapeutic space and thus to be regarded as an experimental object and location.
This study is the first to examine built space in its medical
Effect on dementia was empirically tested – in the sense of a quantitative scientific study. All 4
methods used to test hypotheses H1–H4
are explained in more detail in Chapter 7 - Interdisciplinary Analysis and Data Evaluation.

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[45] Affect = emotional excitement with a physical and motivational expression dimension, cf. URL: http://de.wikipedia.org/wiki/Affekt (July 28, 2014, 4:28 p.m.).

[46] In contrast to a multicenter study, a monocentric study is conducted at one institution.

This combination of methods consists of 4 evaluation methods: 2 geriatric and 2 urban planning methods. Over the application period, the course of depression tested and for the assessment of depression in old age the ADAS manual (Alzheimer`s Disease Assessment Scale). In addition to the neuropsychiatric diagnostics of geriatrics the application mode of the dementia garden and the modalities of the duration of use determined through staff surveys.

The urban planning methodology includes a 3D model carried out after the intervention. Cognitive mapping - a spatial mapping of the open space by the subjects - as well as a subsequent family survey to assess the effectiveness of the open space within the Quarter. Three groups of people are available for data collection, which are responsible for the respective quantitative and qualitative research approaches provide information: The residents of the Fliednerdorf with dementia, the care staff of the care facility and the relatives of the subjects.

research unit (FE)	**geriatrics**	**urban planning**	**urban planning**	**geriatrics**
method	1. Neuro-psychiatric diagnostics	2nd questionnaire *application mode* *"Dementia Garden in the Neighborhood*	3. 3-D cognitive mapping	4. *Effectiveness* Questionnaire *"Dementia Garden"* *in the neighborhood*
focus	depression	useful life	Memory performance regarding various spatial objects	family satisfaction
Research methods	quantitatively Psychometric tests	quantitatively daily reports	quantitatively Oral survey after intervention phase	qualitativ Written survey with response guidelines
data source	residents	staff	residents	relatives

1.3.4 Interdisciplinary approach – 4 cooperating work areas

The study *Urban Spaces for Healthy Ageing* (UDE) brings together 4 departments Consideration. This includes 1. *urban planning,* 2. *project planning* as external service, 3. *geriatrics* and 4. the *local practice* of a rural district. These are represented by 2 university-internal and 2 external institutions: the Institute for Urban Planning and Urban Development and the Department of Psychiatry and Psychotherapy of the LVR-Klinikum Essen. Both are part of the University of Duisburg-Essen. They are for the model development of the entire research study and for the clinical

Evaluation of the effectiveness of the functional therapeutic measures to be implemented

The *Fliednerdorf* test site was developed by Theodor
Fliedner Foundation – an external player in the sector of geriatric care management – to
The concept implementation, the
pre-study personnel qualification and the study intervention in the period of 6
months. Another external actor is the Center for Outdoor Space Design
for people in need of care (ZAPP) in Alfter, which within the project planning the
Open space development and professional personnel qualification of the village employees.

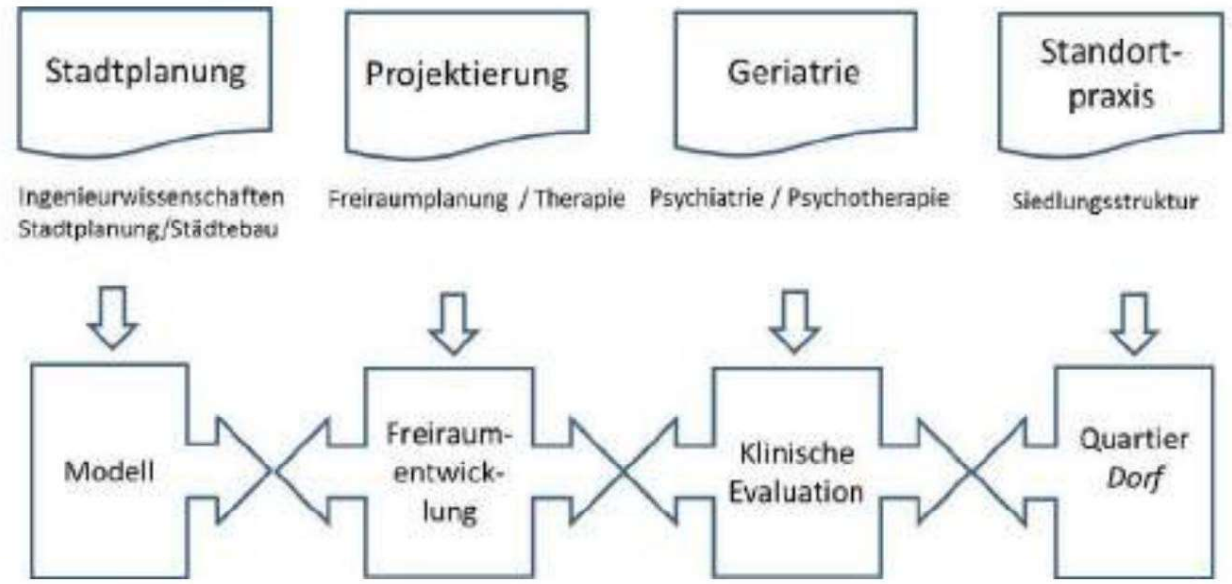

Figure 6. The cooperation organisation chart of the project "Urban Spaces for a Healthy Age" (UDE).
Source: Teimann

department	institutions	jurisdiction	type of cooperation participation
1. Urban planning	Institute for Urban Planning and Urban Development, Profile Focus *Urban Systems,* University Duisburg-Essen (UDE); **Dipl. Ing. S. Teimann: Study structure, concept design, construction planning and implementation of the overall study**	Model open space planning urban planning evaluation	Development of an urban planning approach to cognitive and physiological aging processes of the population (walking disabilities and other impairments).
2. Geriatrics	LVR-Klinikum Essen, Dept. Psychiatry and Psychotherapy (UDE)	Clinical evaluation	Dementia and depression diagnostics using open space in the neighborhood.

3. Site practice : *Village living in old age,* Theodor Fliedner Foundation, Mülheim ad R.		accommodation provision	Test site and location of the Implementation of personnel training for the intervention.
4. Project planning	ZAPP – Center for Outdoor area design for people in need of care, Alfter **Dipl. Ing. S. Teimann: management and concept development**	training curriculum	construction of the test site and personnel qualification.

Figure 7. The 4 disciplines of the study, based on their responsibilities and cooperation participation.
Source: Teimann

The entire research project lasted 3½ years and was divided into 4 phases:

ÿ Preliminary research phase – FV in 2011,
ÿ Development phase – AuPh in 2012,
ÿ Intervention phase – IP in 2013 and
ÿ Evaluation phase – EP in 2014.

Detailed schedule of the overall project

An overview of the entire project is provided in Figure 8 on the next page.

In the preliminary research phase (FV1–FV4) in 2011, the departments of *urban planning* and *Geriatrics* based on the current state of research in dementia-friendly open space planning an interdisciplinary research perspective and hypotheses to be re-examined.

An open space planning analysis of the current situation of the dementia prevention measures used until 2006 was then carried out. Open spaces. The results are presented in Chapter 4 *(Open spaces for dementia and Alzheimer's Dementia) .* The preliminary research phase ended with the selection of the research and Fliednerdorf test site as an exemplary public settlement area. The year 2012 was used for the construction phase (AuPh1–AuPh4) to construct and This was done with the aim of implementing the qualitative intervention in the This included setting up site management,

Construction implementation and the development of site qualification for the intervention. This was followed by 2013 the intervention phase (IP) with implementation of the personnel qualification, the 6-month intervention and clinical diagnostic assessment of the recruited test group.
The measurement times (T1, T2 and T3) were within the 6-month period of the intervention

while data collection using *3D cognitive mapping* is then carried out
The evaluation phase (EP1–EP2) took place in 2014. The hypothesis test
was carried out both in the form of a cross-over analysis using the data pools of *urban planning*
and *geriatrics* as well as further data analysis and result compilation
version taking into account the interdisciplinary perspective.

The complexity of the interdisciplinary approach is illustrated by the presentation of the project process
and the interdisciplinary work packages are shown in Figure 9. Here, the
The respective participation of all four departments in the individual project phases is illustrated.

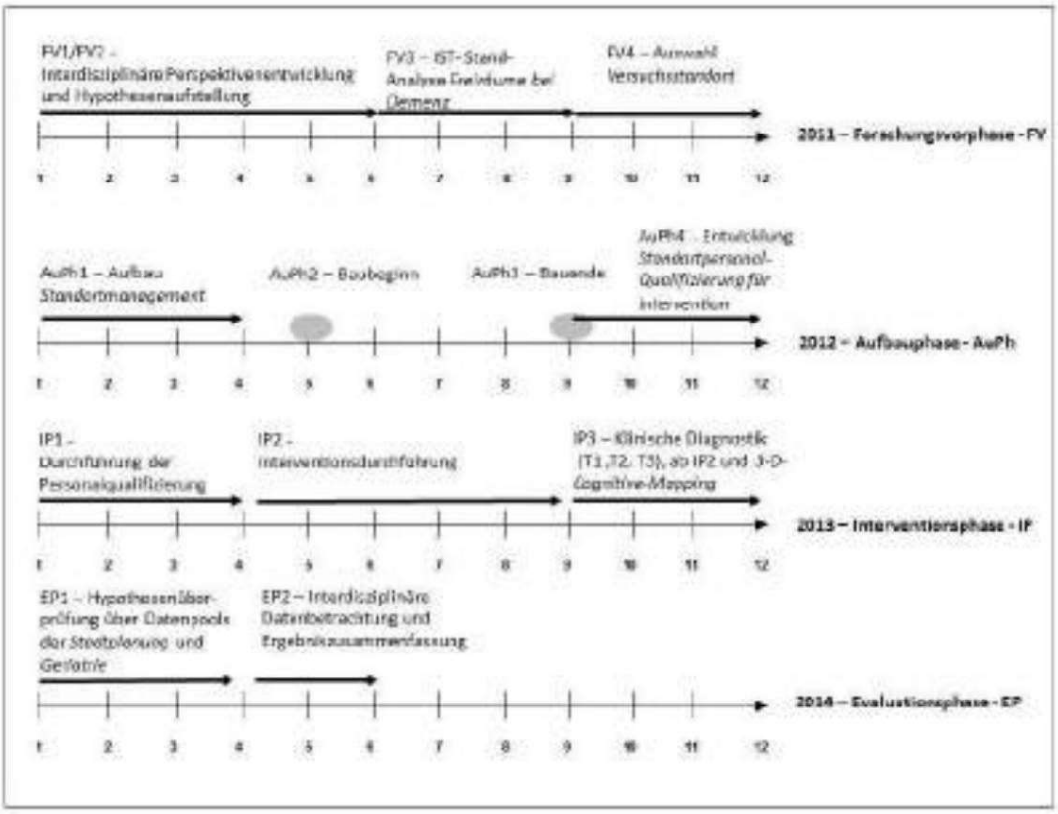

Figure 8. Timeline of the project "Urban Spaces for Healthy Aging" (UDE).
Source: Teimann

Chapter 1.3, *Research questions of the urban planning and geriatric model study,* concludes with an overall overview of the dissertation as a scheme in relation to chapters 1 to 10.

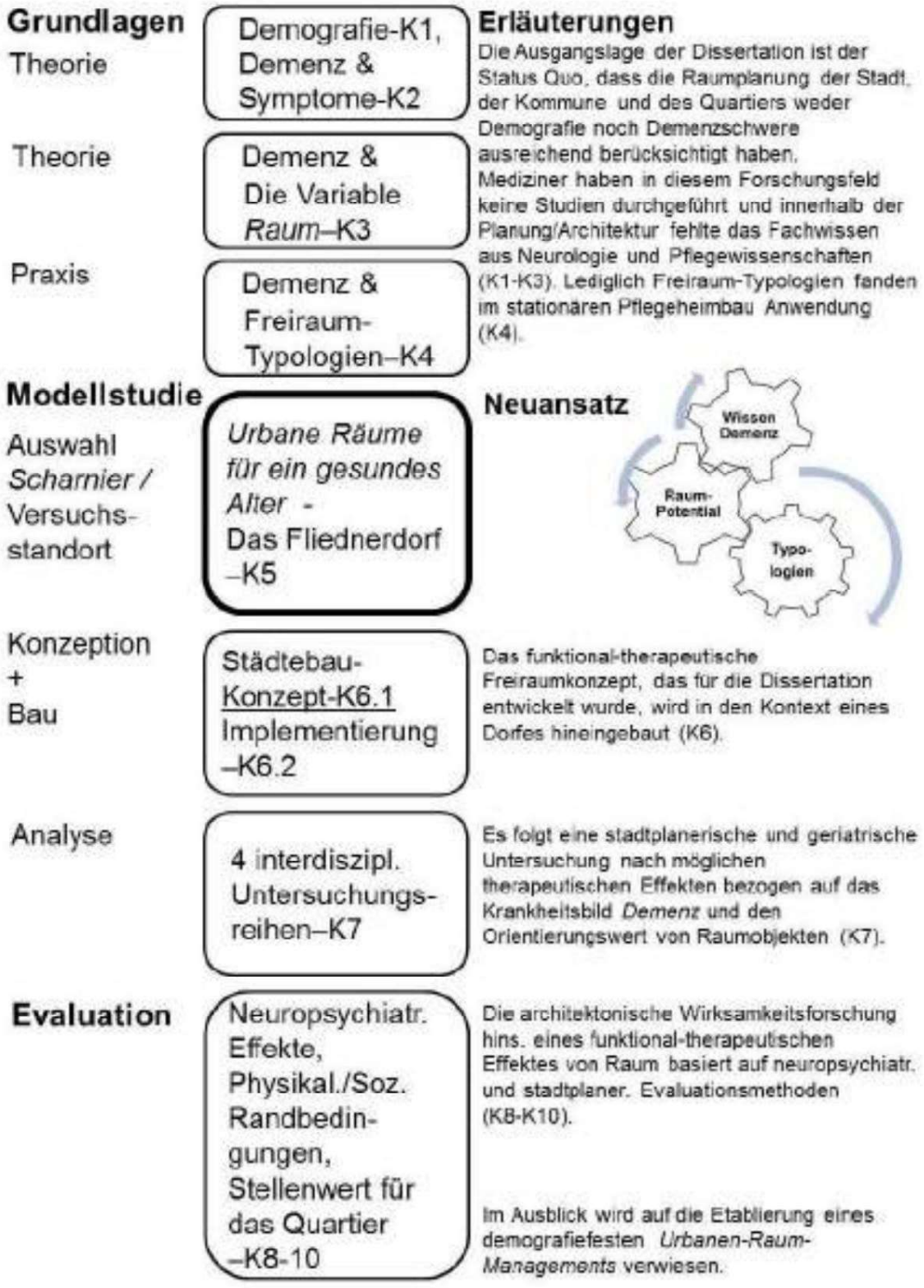

Figure 9. Overview of "Urban spaces for healthy ageing" – An urban planning and geriatric model study.

Source: Teimann

Part A Basics

2 Dementia

To understand the term dementia, it is necessary to point out that
Symptoms of dementia also in the context of cognitive
Dementia itself, however, is not defined as a form of age-related loss, but as a disease. In public,
The terms *dementia* and *Alzheimer's dementia* are mistakenly used synonymously.
Alzheimer's dementia is the most common disease in Western countries, which
Dementia is caused, but it is not covered by the term dementia as a symptom complex.
equate. [47] Dementia is a heterogeneous group of diseases
with various symptoms that can be traced back to different causes. According to the ICD-1048, dementia is treated as a syndrome. This means a symptom complex,
who as

> "[…] group of symptoms that are characteristic of a particular clinical picture with mostly inconsistent or unknown etiology or pathogenesis."49

2.1 Syndrome definition *of dementia*

> "Dementia is a severe loss of mental performance due to a pronounced and long-lasting dysfunction of the brain."50 "Dementia ([deÿmÿnÿ], Latin *demens* "without mind" or *mens* = mind, *de* = decreasing) is a deficit in cognitive, emotional and social abilities that leads to an impairment of social and occupational functions and is usually associated with a diagnosable brain disease."51

In detail, the ICD-10 definition of dementia, which is used in the S3 guideline "Dementia" [52] the German Society for Psychiatry, Psychotherapy and Neurology (DGPPN) and German Society of Neurology (DNG) as follows:

> "Dementia (ICD-10 code: F00-F03) is a syndrome resulting from a mostly chronic or progressive disease of the brain with disturbance of many higher cortical Functions, including memory, thinking, orientation, comprehension, calculation,

[47] Bickel (2012), p. 1 and Mahlberg/Gutzmann (2009), p. 3.
[48] See ICD-10, International Statistical Classification of Diseases and Related Health Problems (2012). WHO diagnostic classification system for medicine. The current version is ICD-10, 2012. URL: https://www.dimdi.de/static/de/klassei/icd-10-gm/kodesuche/onlinefassungen/htmlgm2012/ (23.03.2014, 15:01h).
[49] De Gruyter (1994), p. 1495.
[50] Förstl/Lang (2011), p. 4.
[51] URL: http://de.wikipedia.org/wiki/Dementz (02/20/2014, 11:14 a.m.).
[52] DGPPN/DNG (2009), p. 2.

> Ability to learn, language, speech and judgment in the sense of the ability to make decisions. Consciousness is not impaired. For dementia to be diagnosed, the symptoms must have existed for at least 6 months according to the ICD. The senses (sensory organs, perception) function within the usual range for the person.
>
> Changes in emotional control, social behavior, or motivation usually accompany cognitive impairment; occasionally these syndromes occur earlier. They are seen in Alzheimer's disease, vascular disease of the brain, and other conditions that primarily or secondarily affect the brain and neurons."
>
> [53]

2.2 Epidemiology

distribution in Germany

Dementia is one of the most common diseases of old age worldwide and the probability of developing it increases with age.[54] In Germany, the

The prevalence is given as 1.4 million people. Prevalence is defined as the number of

The term refers to the number of sick people in the population at a certain point in time.

that the number of mild dementia stages may be underestimated due to the sensitivity of surveys.[55]

> “Every year, almost 300,000 new cases occur. As a result of demographic changes, there are far more new cases than deaths among those affected. For this reason, the number of people suffering from dementia is continuously increasing.”[56]

Without any significant advances in prevention or therapy in the future, the number of sufferers is expected to rise to 3 million by 2050.[57]

Year	Estimated number of people over 65 years old in millions	Estimated number of sick people
2010	16.8	1,450,000
2020	18.7	1,820,000
2030	22.3	2,150,000
2040	23.9	2,580,000
2050	23.4	3,020,000

Figure 10. Estimated increase in the number of people with dementia (2010 - 2050).
Source: Bickel (2012)

[53] DGPPN/DNG (2009), p. 2.
[54] Bickel (2012), p. 2.
[55] See Nowossadeck/Nowossadeck (2011).
[56] Bickel (2012), p. 1.
[57] Ibid., p. 1.

According to the Dementia Report of the Berlin Institute for Population and Development,
The risk of disease increases considerably from the age of 80. While in the age group 75 to
79 years, men still with a percentage of 5.04 and women with a percentage
Of 6.67 people affected, dementia occurs in the age group 80 to 84 years at a rate of 12.12 in men and 13.50 in women.58

age group	Men (%)	Women (%)
30–59 years	0.16	0.09
60–64 years	1.58	0.47
65–69 years	2.17	1.10
70–74 years	4.61	3.86
75–79 years	5.04	6.67
80–84 years	12.12	13.50
85–89 years	18.45	22.76
90–94 years	32.10	32.25
95–99 years	31.58	36.00

Figure 11. Prevalence of dementia in different age groups by gender in percent.
Source: Berlin Institute for Population and Development (2011)

If we consider the occurrence of dementia in middle age, dementias occur
comparatively rare. Only 2% of cases occur in the age group under 65 years.
International analyses indicate a prevalence rate of 0.1 % for the 45- to 64-year-old age group.59 It can also be stated that in Germany, women in the
Within the framework of statistical data collection, far more cases of dementia are diagnosed than Men. Women are affected by the disease at 70% and men at 30%. As
The main reason is that women have a higher life expectancy and accordingly
are more strongly represented in the age groups under consideration.[60] The incidence rate indicates how high is the number of healthy persons who, during the course of a year, participated in the
The annual risk of new cases increases from an average of 0.4% among 65- to 69-year-olds to 10% among the very old.61

[58] Berlin Institute for Population and Development (2011), p. 23.
[59] Bickel (2012), p. 2.
[60] Ibid., p. 3.
[61] Bickel (2012), p. 2.

age group	Average incidence rate per year (%)	Estimated number of new cases in Germany in 2010
65–69 years	0.4	17,200
70–74 years	0.9	42,700
75–79 years	1.9	57,000
80–84 years	4.1	81,400
85–89 years	6.5	64,800
90 and older	10.1	35,400
65 and older	1.9	298,500

Figure 12. Annual probability of new cases (incidence rate) depending on age.
Source: Bickel (2012)

duration of illness and mortality

Dementias are progressive and end in death, while the remaining
The duration of the disease is difficult to predict for each individual case. It is assumed that the survival time is shorter the
later the person in question will develop dementia. European studies indicate a
average duration of illness of 3 to 6 years.

> “In some cases, however, survival times of 20 years or more have been reported."62

With regard to the most common causes of death, dementia is, according to the latest
Data collection has moved far forward.

> “The diagnosis group dementia and Alzheimer's accounts for 14,800 women. Deaths are the fifth most common cause of death […], for men it is 6.5 thousand. deaths. […] [These were] still in 20th place for women and 25th place for men in 1998.”63

The following reasons are given for this: (1) demographic development, (2) improved
medical care and (3) since 2003 a strong increase in dementia diagnoses as
cause of death, especially in subgroup F03, “unspecified dementia”, while Alzheimer’s dementia remains relatively constant as a diagnosed cause of death.64

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[62] Ibid., p. 3.
[63] Nowossadeck/Nowossadeck (2011), p. 36.
[64] Ibid., p. 36.

dementia prevalence worldwide

The World Health Organization (WHO) and Alzheimer's Disease International reported in 2012 that 35.6 million people worldwide were suffering from dementia in 2010.65 Alzheimer's Disease International calculated a worldwide Prevalence increase of 44.4 million. This number will increase further to 75.6 million in 2030 and to 135.5 million in 2050.66 Analyses of the *GBD project67 ,* which take continental distributions into account, showed the highest number of dementia cases with 7.0 million. This is followed by East Asia with 5.5 million affected, South Asia with 4.5 million and North America with 4.4 million.

In 2010, the 9 countries with the most dementia cases68 are:

- China with 5.4 million,
- USA with 3.9 million,
- India with 3.7 million,
- Japan with 2.5 million,
- Germany with 1.5 million,
- Russia with 1.2 million,
- France with 1.1 million, Italy
- with 1.1 million and Brazil
- with 1.0 million.

Alzheimer's Disease International, together with the WHO, published a study based on the worldwide prevalence data show a disproportionate increase in low-middle-income countries (LMIC)69 compared to high-income countries70. By the date of publication, the

Frequency distribution of 37.9 million dementia cases in high income countries and 106.5 million dementia cases in low middle income countries (LMIC).71 Other sources, however, state that due to a lack of comparative studies and

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[65] WHO/Alzheimer's Disease International (2012), p. 8.

[66] See URL: http://www.alz.co.uk/research/statistics (03/23/2014, 5:01 p.m.).

[67] GBD, *Global Burden of Disease* is a project that was initiated in 1992 by the Harvard School of Public Health (Harvard University), the WHO and the World Bank. This project collects data on 135 diseases in their worldwide distribution and in their frequency as a cause of mortality. The aim is a worldwide improvement of health conditions.

[68] WHO/Alzheimer's Disease International (2012), p. 12.

[69] LMIC: *lower middle income* country . The World Bank assigns the economic status of an LMIC to a gross national income per capita between $1,006 and $3,975. It is further classified into low income (less than $1,006), upper middle income ($3,976– $12,275) and *high income* ($12,276 and more).
URL: http://de.wikipedia.org/wiki/Lower_Middle_Income_Country (03/13/2014, 1:50 p.m.).

[70] There is no English translation for *high income country* . The World Bank's definition of *high income economy* is: A country with a gross national income per capita of more than $12,615.
URL: http://en.wikipedia.org/wiki/World_Bank_high-income_economy (03/13/2014, 1:50 p.m.).

[71] WHO/Alzheimer's Disease International (2012), p. 19.

Due to the incomplete availability of patient data, no empirically viable, geographically or economically based distribution clusters could be determined.72

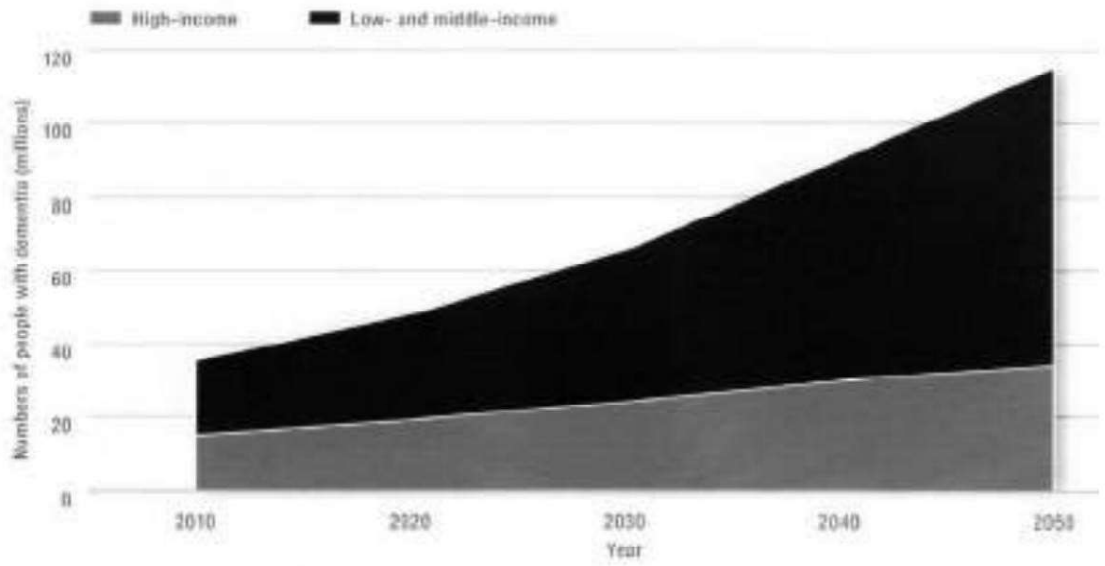

Figure 13. Increase in dementia cases in low-middle-income countries (LMIC) compared to high-income countries.

Source: Alzheimer's Disease International (2012)

It should be noted here that the listed worldwide prevalence of dementia and its prognosis for the future have been summarized according to the current publications.

2.3 Diagnostic criteria according to ICD-10 and DSM-IV

In the expert consensus, in the sense of Good Clinical Practice, early diagnosis is considered The basis for early patient treatment and care is recommended. Since the Dementia is a dynamic progressive disease, but in the early stages of the disease Disease by means of timely special therapies in a combination of drug and non-drug treatment approaches to disease progression and thus reduce the general burden on relatives. In clinical practice Special care is recommended in diagnostics to avoid accumulation of false positive diagnosis. This is especially true for clinical threshold testing between largely cognitive age-normality and mild dementia. The *S3 guideline Dementias* stipulate that the syndrome diagnosis and corresponding medical classification of the creation, taking into account all individual case information.73

[72] See Bickel (2012), p. 3.
[73] DGPPN/DNG (2009), p. 9.

FÖRSTL and LANG74 summarize the diagnostic criteria according to the ICD-10 and the DSM-IV, the psychiatric diagnostic classification system of the *American Psychiatric Association75* , In dementia syndrome, in addition to a general memory impairment, the Disturbance of the absorption and retrieval of new information and general cognitive deficits exist.

feature	**ICD-10**	**DSM-IV**
memory impairment	Amnesia76 (objective impairment, especially when learning new information)	amnesia
Other cognitive deficits judgment, thinking ability		Aphasia77, apraxia78, agnosia79 , Dysexecutive Syndrome80 (*)
disturbances of experience and behavior	Disorders of affect control, drive or Social behavior (emotional instability, Irritability, apathy, coarsening of behavior) (*)	-
threshold criterion	Severity diagnosis based on ICD-10 Significant impairment of social and occupational	Services (Activities of Daily Living, ADL)
Length of time	At least 6 months	-
exclusion	confusion81	No rapid clouding of consciousness (state of confusion due to other primarily psychological illnesses (e.g. depression, schizophrenia)

Figure 14. Diagnostic criteria for dementia syndrome according to the 10th revision of the International Classification of Mental Disorders (ICD-10, research criteria) and the 4th revision of the Diagnostic Manual of Mental Disorders (DSM-IV.) (*) = At least one of the features must be met.
Source: Förstl/ Lang (2011)

[74] Förstl/Lang (2011), p. 5.
[75] DSM-IV *(Diagnostic and Statistical Manual of Mental Disorders) is* a classification system of the American Psychiatric Association. The 4th revision was published in 1994.
[76] Amnesia = impairment of memory defined in terms of time or content. See De Gruyter (1994).
[77] Aphasia = central language disorder after language development has been completed. See De Gruyter (1994).
[78] Apraxia = Disturbances of actions or movements and inability to grasp objects while retaining To use movement ability, motility and perception sensibly. See De Gruyter (1994).
[79] Agnosia = disorder of elementary perception. See De Gruyter (1994).
[80] Dysexecutive syndrome = "[…] Inability to direct a stream of thoughts into the necessary steps for the implementation of a plan of action necessary concentration, straightforwardness and stability." Calabrese/Förstl/Lang (2011), p. 18.
[81] Confusion = qualitative disturbance of consciousness in the sense of a clouding of consciousness with thought disorders, memory distortion and disorientation. De Gruyter (1994); "The symptoms usually develop within a short period of time and show a fluctuating course. The duration ranges from a few hours or days to several months. Not all symptoms always disappear completely." Förstl/Bickel (2011), p. 192.

According to the ICD-10, this includes judgment and thinking skills, while the DSM-IV
Occurrence of aphasia, apraxia, agnosia and dysexecutive syndrome.
In addition, the symptoms must be so severe that everyday life becomes
impaired. For a positive diagnosis, a temporary state of confusion must be excluded and the overall
symptoms must last for more than 6 months.82

Neuropsychological examinations

As a further and complementary screening procedure, testing of the
cognitive status of the patient based on an MMSE test *(Mini-Mental State Examination)*
carried out by the family doctor. However, if the deficits are discrete, they affect
Functional areas that are not tested during screening, or was the patient
above-average premorbid performance, such procedures are not sensitive enough, so that incipient
dementia can easily be overlooked.83 It should be noted that
to point out that

> "[…] both the conduct of the examination and the interpretation of the results are made more difficult by increasing severity of the disease and existing multimorbidity84."85

> "A special feature of [further in-depth] neuropsychological diagnostics is the use of standardized tests that meet psychometric quality criteria, the results of which enable an assessment of the patient relative to the (possibly age-, gender- and education-specific) norm population."86

This involves the quantified recording of various cognitive functions such as
Perception, memory, attention, language, psychomotor skills, planning and visual construction,
action control, deductive reasoning and intelligence.87
Whether a further neuropsychological examination, which is time-consuming and
on the other hand, it is hardly feasible *lege artis* without special expertise , is recommended for the
affected person, as shown by the following indication areas.88

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[82] See Förstl/Lang (2011), p. 6.
[83] See Jahn (2010).
[84] Multimorbidity = simultaneous existence of several diseases. See De Gruyter (1994).
[85] Theml/Jahn (2011), p. 344.
[86] Theml/Jahn (2011), p. 339.
[87] See Lezak/Howieson/Loring (2004).
[88] Theml/Jahn (2011), p. 340.

Indications for neuropsychological examination using psychometric tests in:
1. questionable, atypical and mild cognitive deficits,
2. subjectively complained of performance losses in above-average capable persons with or without depressive mood,
3. Preparation of a psychometric profile analysis to differentiate between impaired and preserved cognitive functions and/or
4. quantification of cognitive impairments for follow-up assessment.

> "To exclude an event [that can be traced back to another cause of the disease], a diagnosis including cerebral imaging is required89
> It is also advisable to repeat the cognitive screening at appropriate intervals."90

2.4 Types of dementia

The main forms are Alzheimer's dementia, vascular dementia, Lewy body dementia, frontotemporal

Dementia, the dementia syndrome in normal pressure hydrocephalus and those associated with alcohol consumption

Dementias are degenerative diseases that account for 90% of all dementia cases.

Alzheimer's dementia occurs with a frequency of 60%, followed by vascular dementia with 15%,

which, due to inconsistent diagnostic procedures and the high number of

Mixed forms can vary greatly in their occurrence.

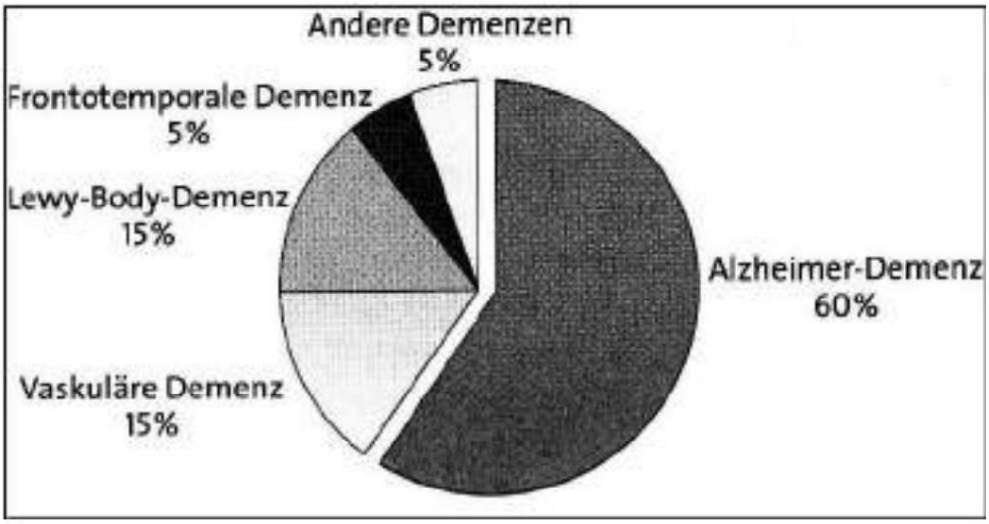

Figure 15. Relative frequency distribution of the main forms of dementia.
Source: Mahlberg/ Gutzmann (2009)

[89] Cerebral imaging includes diagnostic methods that provide images from the cerebrum. (Lat. *Cerebrum* = brain). See De Gruyter (1994).
[90] Mahlberg/Gutzmann (2009), p. 6.

Lewy body dementia comes in third place in the frequency distribution with 15%.
Frontotemporal dementia and the other dementias are each allocated 5% within the overall
distribution.91 In the following, the first 4 main forms of dementia are discussed.
dementia.

Alzheimer's dementia

In the most common form of dementia, Alzheimer's dementia, it is noted that it
The majority of cases are sporadic. However, there are also rare, early manifesting
Cases with gene mutations that are inherited in an autosomal dominant manner. Even without the occurrence
Due to a gene mutation, this form of dementia has a familial predisposition. It is then
given if at least 3 cases have occurred in two generations. In Alzheimer's dementia, amyloid
plaques92 are becoming the most important explanation for the cause of the disease.
accumulate in the cerebral tissue. It is assumed that these are intraneuronal and
have a toxic effect in the extracellular space and promote the death of neurons. This leads to
brain atrophy and a reduction in the production of the important neurotransmitter
Acetylcholine. Ultimately, the result is impairment of brain metabolism and general brain
performance.93

> "[Alzheimer's dementia] is a systemic brain disease that […] ultimately leads to the death of neurons in the cerebrum, the basal forebrain, and, to a lesser extent, the brain stem."94

It is assumed that neurodegenerative diseases have already occurred 20 to 30 years before the diagnosis is made.
changes and the first cognitive disorders occur 5 to 7 years before diagnosis.
While everyday practical skills are still largely preserved,
Difficulties in learning new content and maintaining attention
and executive control functions. In the stage of mild dementia, which occurs between 2 and 3 years
indicated, the following symptoms occur: general memory impairment, reduction
loss of control over movement sequences, disturbance of visual perception and
spatial vision, word-finding difficulties and reduced vocabulary. These
Symptoms lead to a noticeable impairment of previously performed daily activities, which
manifests itself in a disorientation in new surroundings. In the stage of
In moderate dementia, which lasts about 3 to 5 years, language impairments usually occur.
Communication difficulties and movement patterns with diminishing sense of context are also present.

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[91] See Mahlberg/Gutzmann (2009).
[92] Amyloid plaques = the body's own, misplaced protein structures
[93] Schmidtke/Hüll (2005), p. 152.
[94] Ibid., p. 152.

Individual activity can vary from strong apathy and hyperactivity or restless
In addition, the senseless repetitive
Execution of movement patterns. Those affected often suffer from
Impairment of sleep behavior with disturbances of the night-day rhythm and a
shortened, restless sleep. Delusional symptoms – often of a paranoid nature – can be isolated, but also appear in complex delusional systems. In the course of dementia, their frequency of occurrence is estimated at about 16%.95

> “A specific connection to cognitive disorder patterns exists here in misidentifications or misinterpretations due to incorrect or outdated cognitive representations.”96

The most common psychopathological change within the clinical picture is the
depressive syndrome. It affects about two thirds of sufferers.
Restriction of motor skills is described, among other things, with Gerstmann syndrome, which affects 4
Symptoms include: (1) the demented person has difficulty naming his own fingers and toes97, (2) he confuses right and left98, (3) he has great difficulty writing99, despite having the appropriate motor and cognitive skills, and (4) he has difficulty calculating100, despite having the appropriate memory skills.

With regard to the overall disease, it can be said that

> "[...] there are clear individual differences in the rate of progression and clinical-neurological profile. [...] In contrast to most other degenerative and symptomatic diseases, AD [sic] manifests itself over the years as pure dementia, i.e. with intellectual and psychological disorders, without significant physical symptoms. Only in the advanced stage do physical-motor symptoms occur."101

The last stage of dementia is often characterized by motor disorders, apathy and
Incontinence. Patients are bedridden and have difficulty eating
Difficulty swallowing. As the cerebral spread of amyloid plaques progresses,
vegetative sweating or epileptic seizures can occur. The average life expectancy after diagnosis is 10 to 12 years.102

There is no medication that cures the disease. According to the *S3 guideline on dementia ,*
treated symptomatically, ie the medication is administered to the accompanying symptoms

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[95] See Rapp (2009), p. 16.
[96] Ibid., p. 16.
[97] Finger and toe agnosia, cf. De Gruyter (1994).
[98] Right-left disorder, cf. ibid.
[99] Agraphia, cf. ibid.
[100] Acalculia, cf. ibid.
[101] Schmidtke/Hüll (2005), p. 152.
[102] See Rapp (2009), p. 17.

by trying to counteract them. Treatment with

Acetylcholinesterase inhibitors, with the aim of stabilizing the existing

Brain performance level. This temporarily facilitates the performance of everyday activities and

the general condition of mild and moderate dementia is improved. The guideline gives

In addition, in moderate to severe Alzheimer's dementia, the drug

Memantine.103

vascular dementia

Vascular dementia includes all dementias that are caused by diseases of the brain vessels

When making the diagnosis, a

> "... there must be a temporal relationship of 3 months between the occurrence of the cerebrovascular events [such as a stroke] and the development of dementia, or the symptoms must be characterized by abrupt onset, fluctuating course or gradual deterioration."104

As mentioned above, it is difficult to quantify vascular dementia.

because especially in old age the so-called *mixed dementia,* the mixed

Dementias occur. This means that in addition to the symptoms of vascular dementia

Alzheimer's dementia can also occur: destruction of cerebral tissue by amyloid

Plaques and damage to brain vessels. As a result, a clear differentiation

It is not always possible to classify dementia into a single form. In Europe and North America, vascular

Dementia is the second most common form of dementia, while in Asia it is the most common with 50%

Men are more likely to be affected by vascular dementia. It is also worth noting that

Compared to Alzheimer's dementia, the average life expectancy for vascular dementia is lower.105 Treatment

primarily takes into account risk factors affecting the cardiovascular system and the underlying diseases.106

Lewy body dementia

In this form of dementia, the nerve cells in the brain stem and cerebral cortex –

As in Parkinson's disease, a cytoplasmic107 inclusion body was found.

The clinical picture is characterized in particular by symptoms such as disturbance of the motor

control processes, fluctuating cognitive deficits, visual or auditory hallucinations

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[103] DGPPN/DNG (2009), p. 25.
[104] Haberl/Schreiber (2005), p. 222.
[105] See ibid.
[106] DGPPN/DNG (2009), pp. 27-28.
[107] Cytoplasm = plasma enclosed by a cell membrane, which contains various substances dissolved in water, cf. De Gruyter (1994).

as well as falls and short-term loss of consciousness. Retrospective analyses pointed out that these symptoms occur noticeably more frequently than in Alzheimer's dementia.108 The quality of life of those affected and their relatives is considered to be lower in Lewy body dementia than in Alzheimer's dementia.109 There is no approved or sufficiently documented medication.

Frontotemporal dementia

Frontotemporal dementias include a group of diseases of the central nervous system, that affect the frontal or temporal lobe of the brain. While memory performance and the ability to orientate is not strongly affected at first, the following common Symptoms of this group of diseases: Behavioral problems with Personality changes, impairments in language skills and naming disorders and word comprehension. The core symptoms of frontotemporal dementia are the decline of social behavior, a flattened affect and the lack of insight into the illness. The typical The age of onset is between 45 and 60 years. The outbreak rarely occurs before 30 or after the age of 75. The average duration of the disease is between 6 and 8 years110. The *S3 guideline* of the *DGPPN* and the *DNG* does not specify any specific drug treatment here, as is the case with Lewy body dementia.111

Treatment

Medicine has not yet been able to develop any medication or other measures that The cerebral process and the Causes of nerve cell destruction in degenerative forms of dementia are not yet fully enlightened. Education or intellectual training helps to retain knowledge that has been accumulated for a long time as a resource. However, the ability to learn, think and combine will gradually disappear.112

> “The best treatment that a person suffering from dementia can receive according to the current state of scientific knowledge therefore consists of three pillars: firstly, advice that makes full use of all available care structures; secondly, stimulation of the remaining mental abilities, feelings, memories and motor skills through appropriate therapies; and thirdly, adapted treatment with the existing medications. However, these are currently not being used in sufficient quantities.
>
> dimensions."113

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[108] Wallesch/Förstl (2005), p. 176.
[109] Drach (2009), p. 31.
[110] See Ibach (2005).
[111] DGPPN/DNG (2009), p. 29.
[112] Berlin Institute for Population and Development (2011), p. 13.
[113] Ibid., p. 13.

3 Dementia – Space – Health

So far, space has been used as a therapeutic environmental variable primarily in
closed interior areas of clinics and residential structures in the care sector.
To improve the quality of life of people with dementia in inpatient
Institutions are currently also focusing on landscape planning, Horticulture Therapy (HT)
and the design service deals with this focus. It is important to check
whether free spaces based on previous therapeutic approaches can facilitate compensatory
Potential for inner cities and town centres that is sufficient for the adequate consideration of the
Perception, orientation and mobility behavior of seniors and dementia patients in
open space would be required. This could create a new link to the urban
Spatial function in the context of *space & city & health .*

Let us now consider the following key points:

- ÿ Space and cognition in dementia,
- ÿ Space and perception in dementia,
- ÿ Potential of the room for dementia and
- ÿ Space as a compensatory strategy in dementia.

3.1 Space and cognition in dementia

3.1.1 Dementia room context according to Gutzmann

In comparison to architecture for non-dementia sufferers, the space in dementia-oriented
Planning is assigned a special position. For planning practice, space is considered as empirical
described and as narrowly defined as possible reference framework is of great relevance.

Rooms with an inviting character must be developed that are suitable for people with mental
Age-related impairments and dementia are not negatively associated with stress, but also
This requires the basic understanding that space is a
Environmental variables – like other therapeutic interventions – of dementia patients and
is perceived differently by non-demented people.

GUTZMANN describes the quality of the environmental variable Space for Dementia Patients as follows:

> "A small change in environmental conditions, which might be barely noticeable to healthy older people, can have a disproportionately large effect on performance and quality of life in people with dementia."[114]

The decisive factor here is GUTZMANN's description of an individual ability to adapt,

which covers the area of maximum comfort and the area of maximum performance

The latter decreases sharply with dementia.

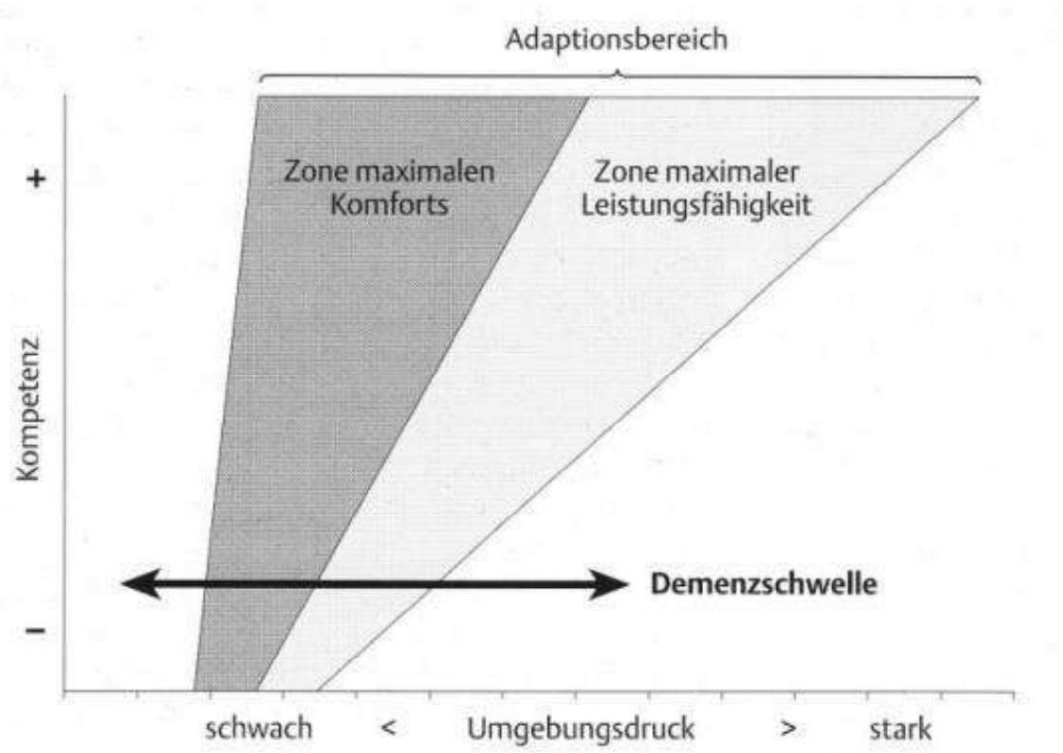

Figure 16. Dynamic relationship between the old (or demented) person and his surroundings.
Source: Gutzmann (2003), modified from Lawton (1983)

In Figure 16, the individual competence

as ordinate and the request pressure as abscissa. The graph illustrates

thus the dynamic relationship between the old (or demented) person and his

Vicinity.

> "The diagonal marks a homeostasis between environmental demands and compensatory capacity, i.e. the area in which the actual tasks can be tackled under individually optimal conditions. […] The figure suggests that in normal cases a little more environmental pressure improves performance.

[114] Gutzmann (2003), p. 62.

> optimized, while a slight reduction signals relaxation. Below or above this level are under-challenges up to sensory deprivation or over-challenges in the sense of harmful stress."[115]

3.1.2 Orientation time window according to Reisberg (GDS)

When it comes to the question of which attributes the room must have in order to be suitable for people with dementia, adequate pressure to demand, it is necessary to consider the period in which the affected person can still orientate himself largely independently.

The orientation deficit, which is primarily due to neurophysiologically caused Memory impairment increases with the progression of the disease. For relatives and care facilities, this means a high cost Control and security effort. Therefore, it is difficult to prevent immobility in Immobility can gradually lead to the establishment of sitting culture, which then leads to the need for increased accommodation in wheelchairs to the lying care position in closed living areas. In this way, those affected gradually lose sensory abilities and a state of emotional impoverishment.

The question here is: Can one define a time frame for Alzheimer's dementia? And further: Can one define additional perceptual qualities such as direction recognition and object recognition?

REISBERG et al. developed the GLOBAL DETERIATIONS SCALE (GDS)116, a 7-staged diagnostic scale by systematically assessing the degradation of mental and physiological Performance and orientation ability of individual dementia stages or disease stages (see Figure 17). The testing procedure (GDS) takes place until used today in Alzheimer's diagnostics.

According to REISBERG et al., the first signs of the disease can be seen at the onset of stage 3. Orientation difficulties in unfamiliar surroundings may occur. However, they are Manifestation of the disease is not a sufficient condition. Only moderate dementia, Stage 5 is accompanied by frequent confusions in space-time perception. The Personal desire for accompaniment in the room will then be fulfilled within the medium to

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[115] Gutzmann (2003), p. 62.
[116] See Reisberg et al. (1982).

severe dementia, stage 6, while in the stage of severe dementia, stage 7, independent movement – even with aids – is no longer possible.117

When considering the still independent ability to orient oneself,

Average life expectancy is 4 to 8 years, but this may be the case with dementia.

a guided and controlled mobility over a period of several years.

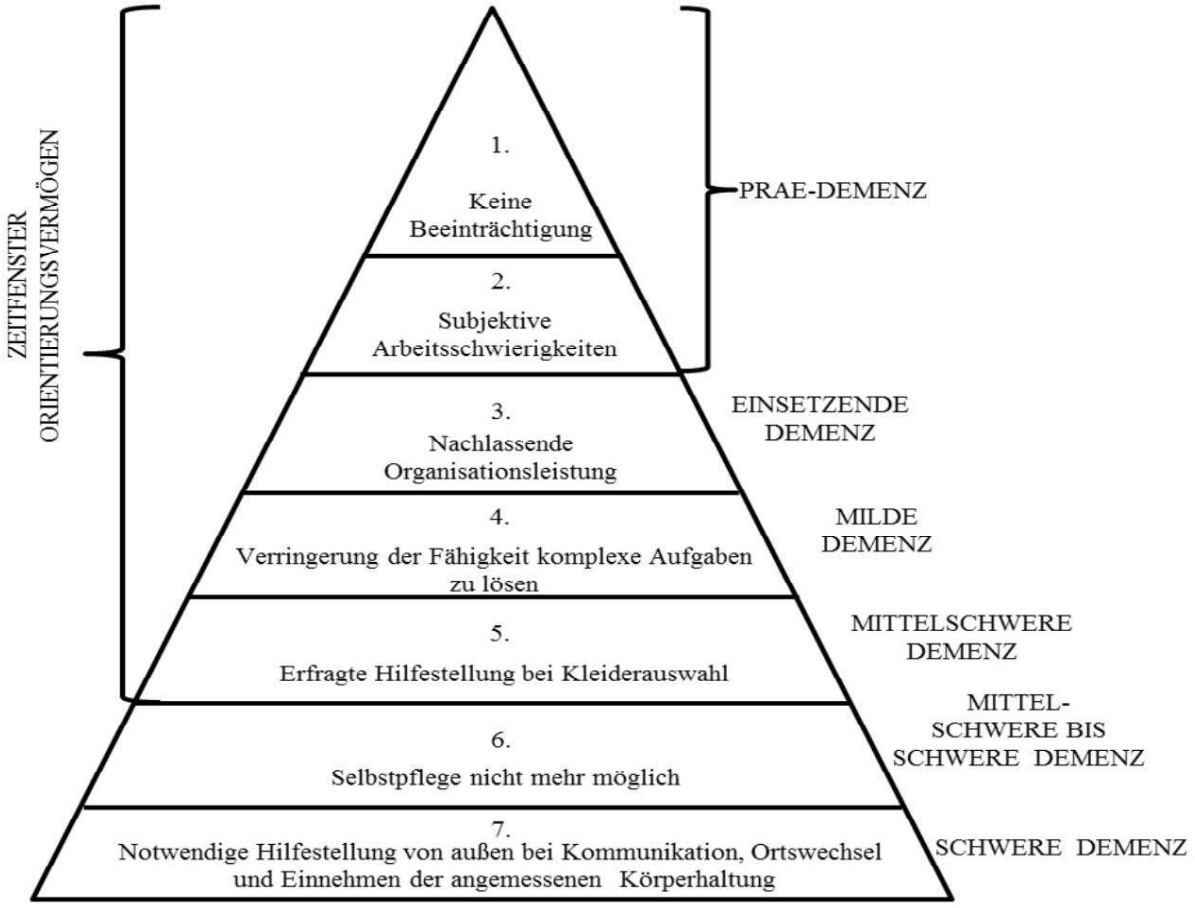

Figure 17. The Reisberg stages of Alzheimer's dementia related to the "time window of orientation".

Source: Teimann

According to the ICD-10 (International Classification of Diseases)118, the temporal

The course of the disease is classified according to the onset of the disease as follows: mild or mild dementia after 2 to 3 years, moderate dementia after 4 to 5 years and severe dementia after 6 to

7 years

[117] See Reisberg et al. (1982).
[118] See Dilling/Freyberger (2001).

This means that the ability to orientate oneself lasts a maximum of 5 years after the onset of the disease. including the 5th stage, moderate dementia.

This could mean that neighbourhood strategies in terms of promoting mobility and activity for people with dementia in public spaces for a period of 5 years – with an average of 8 years of disease progression – could be applied.

3.1.3 Spatial and temporal perception fluctuations according to Johnson

The cognitive estimation of spatial dimensions in non-demented individuals was investigated in the discipline of perceptual geography in the 1970s as a sequential process of 4 decisions. These are

(1) the decision to stay or go,
(2) the decision to take a direction,
(3) the decision to take the path and
(4) the decision how to get there. [119]

To what extent the ability to orientate oneself and to find goals gradually decreases in the course of dementia are limited, to what extent information is received from the immediate space, sequentially processed in a certain perceptual radius and then into a How actions can be implemented has not yet been described.

Neurology makes the following observations regarding memory functions and memory structures: statements, namely that

> "unilateral brain damage to material-specific (verbal or nonverbal) [sic] memory disorders, while bilateral brain damage leads to global memory disorders […]. On the other hand, it must be taken into account that patients with memory disorders are also able to draw on already consolidated knowledge or to perform certain learning tasks."[120]

In order to gain a more comprehensive understanding of the spatial and temporal perception of a To get Alzheimer patients, JOHNSON and JOHNSON developed the model *Trip back in time* (see Figure 18). In it they show that memory contents in dementia patients are

[119] See Cadwallader (1976).
[120] Calabrese/Lang/Förstl (2011), p. 23.

intermittently and regressively linked to increasingly distant phases of life.121

JOHNSON and JOHNSON emphasize the fluctuating, non-linear disease course and criticize the linearity of the model by REISBERG, which varies from day to day and from month to Month observed memory fluctuations that occurred in bursts, between which gradual phases of improvement occurred. The two authors recognize on the one hand the benefit of REISBERG's GDS for clinical diagnosis. On the other hand, however, they point to a possible under- or over-challenge of patients in Care facilities that, based on this strict diagnostic classification, provide nursing care could occur.

Fundamental to JOHNSON's model *Trip back in time* is the onset of the disease in Appearing change in the perception of the self in time and space. With the As the disease progresses, the short-term experiences become increasingly difficult for the affected person to recall, The childhood memory becomes more and more vivid until the affected person can recall it almost exclusively retrieves.

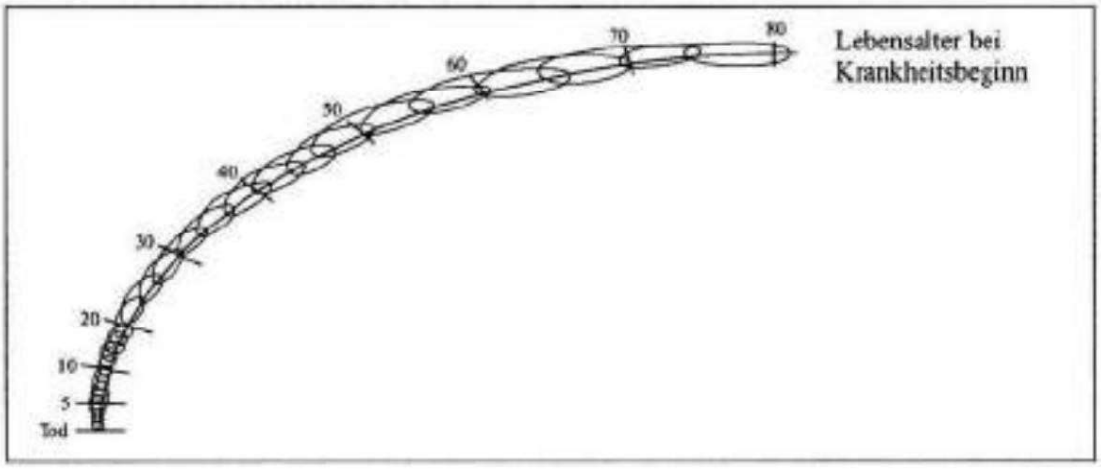

Figure 18. The "Trip back in time" model.
Source: Johnson et al. (2000)

The patient experiences himself in an emotional field of tension, since the subjective experience and precisely as information processed does not correspond with his immediate environment. His subjective perception of temporal and spatial continuity is disturbed. It must be It should be taken into account that for this reason too, decisions on direction and Directional assignments of targeted targets cannot be maintained for a sufficiently long time can.

[121] See Johnson/Johnson (2000).

3.2 Space and perception in dementia

In the following, we will consider the status of perception, which changes with increasing Age, but also with the onset of dementia. It should be noted that the Impairments of cognitive performance due to dementia beyond the level of usual age-related perceptual limitations.

3.2.1 Vision

In the BERLIN AGE STUDY (BASE), an interdisciplinary universal study, in the chapter *Sensory Systems in Old Age* [122] most visual disorders of old age in three Groups: 1. normal peripheral changes of the lens and optical apparatus; 2. normal central cerebral changes such as nerve cell loss, degeneration of neuronal processes, changes in neurotransmitter secretion and synaptic Degeneration and 3. Diseases of the eye and its appendages. These include for example, senile cataracts, glaucoma and retinal degenerations such as diabetic retinopathy and senile macular degeneration. They are the four most common Diseases of the visual system in old age and affect approximately 19% of 65- to 74-year-olds. year-olds and almost 50% of those aged 75 and over.

The main consequences of central nervous changes and peripheral neuronal changes in the retina include

(1) loss of contrast sensitivity and visual acuity,
(2) the temporal stimulus resolution,
(3) colour discrimination,
(4) dark adaptation,
(5) the restriction of the field of vision and
(6) impairment of stereopsis/spatial vision.

The chapter “Morbidity, medication and functionality in old age” of the BASE states, that 95.6% of the 70-year-olds wear distance and/or near glasses and 16.9% use a magnifying glass. Of these groups, 26.6% are classified as visually impaired; those affected have a near and/or distance visual acuity of less than 0.2.123

[122] See Marsiske et al. (1999).
[123] See Steinhagen-Thiessen/Borchelt (1999). Distance visual acuity 0.2 = without glasses, a distance visual acuity of 20% can be achieved.

When looking specifically at the vision of people with dementia, CRONIN-
GOLOMB attributes the impairments listed above to changes in higher memory structures.124 He shows that in Alzheimer's dementia, individual
visual abilities such as color discrimination, depth perception and contrast sensitivity
are more severely impaired than with the usual age-related visual impairment. Consequently,
This decline in performance does not necessarily have to be an age-related
In empirical studies on visual pattern recognition in
Alzheimer patients were examined to see whether object recognition using color or
The result was that the recognition of the color marking occurred in a shorter time compared to the shape marking125. For the
In planning practice this means: When recognizing orientation aids,
of the dementia primarily according to the color and then according to the shape (ÿ *Color comes first Form).* Studies from the 1980s had already pointed to specific
Impairments of visual functions in old age. PASTALAN and HIATT published
Research results, according to which in the following years individual *tools* and
Recommendations for action in the architecture. For this, see the following
The following are *study results regarding vision in old age with*
planning relevance.

In order to promote walking safety and path recognition in the planning of space, it is necessary to Examination results to be considered:

Study results regarding vision in old age with planning relevance	
for non-demented seniors	*specifically for Alzheimer's dementia*
Older people find it increasingly difficult to identify objects in relation to their background.126 Floor markings can, for example, U. are perceived as obstacles and lead to confusion.127	In object recognition, *color comes before shape128* .

These empirical results are incorporated into the planning measures and elements of the regulation for barrier-free construction, e.g. as recommended white marking of stair edges.

[124] See Cronin-Golomb (1995).
[125] See Cernin/Keller/Stoner (2003).
[126] See Pastalan (1982).
[127] See Hiatt (1980).
[128] See Cernin/Keller/Stoner (2003).

"Marking all the edges of steps, as opposed to marking only the bottom and top steps, is a noticeable safety gain, not only for the visually impaired. […]
[This also applies to] cognitive impairments [such as]

- Limitation of perception due to reduced attention and Information absorption,
- reduced recognition, understanding and consequently delayed reaction to new information, •

coordination skills, •
disorientation, memory loss, memory disorders and • speech disorders."129

3.2.2 Hearing

SAUP writes in his treatise *Age and Environment:* An Introduction to Ecological Gerontology with regard to presbycusis, the age-related hearing loss , that it is mainly caused by 2 Forms of hearing impairment associated with aging: the *sensory presbycusis* and *neural presbycusis.It* primarily represents the age-related Changes in the sense of hearing that could be relevant for structural environmental adaptation:

" *Sensory presbycusis* is caused by wear and tear of the auditory receptor cells in the inner ear, which leads to a limitation of hearing at higher frequencies. The death of the auditory cells responsible for the higher frequencies results in a gradual change in hearing ability. In men, hearing ability begins to decrease at around the age of 32 and in women at around the age of 37. [...] Very high tones are particularly difficult to hear when they are quiet. Men and people in industrial metropolitan areas are more likely to suffer from age-related loss of hearing ability for audible frequency tones than women and people in rural areas. [...] Neural *presbycusis*

appears to be caused by changes in the brain. This form of age-related hearing loss affects speech perception. Since disturbing background noises in particular contribute to impaired hearing, it is also known as 'cocktail party hearing loss'. While young people are generally able to tune out disturbing noises when listening to a conversation and filter out the conversation partner's message from a variety of sounds without great difficulty, adults often have increasing difficulty fully following an interpersonal conversation as they get older, especially when people are speaking quickly and unclearly or when background noises (e.g. a television on or conversation at the next table) disturb the conversation. Such impairments can hardly be compensated for by a hearing aid, which also amplifies interference. […]

With increasing age, there was a loss of hearing for speech, a decrease in overall word comprehension, a loss of discrimination, a side-differentiated deficit in dichotic discrimination (i.e., significantly more words are understood in one ear than in the other) and differences in binaural summation (i.e., the ability to synthesize low and high frequencies when, for example, repeating words

[129] URL: http://nullsperr.de/din18040-1-konzepte.htm#kognitiv (11/15/2013, 11:07 a.m.).

Words are presented to one ear only in the low frequency range and to the other ear only in the high frequency range). However, significant *presbycusis* could only be detected from the age of 70 and serious disorders of speech comprehension only in the 90-year-old group ."130

sense of hearing	*age*					
restrictions	*30*	*40*	*50*	*60*	*70*	*80*
reduced hearing in men	32 →					
reduced hearing in women	37 →					
susceptibility to background noise	45 →					
side-different failure at dichotic discrimination					70 →	
significant presbycusis					70 →	
severe impairment of speech comprehension						90

Figure 19. Changes in hearing in adulthood.
Source: Saup (1993)

3.2.3 Sense of balance

"The balance function serves to determine posture and orientation in space."[131]

For stable walking in older people, the sense of balance is an important functional capacity for mobility, although it is not assigned to the 5 main senses. These include the visual sense, the auditory sense, the olfactory sense, the gustatory Sense and the tactile sense. In modern physiology, the sense of balance is considered vestibular sense is counted among the *4 other senses* . The remaining three are thermoreception (temperature sense), nociception (pain sensation) and proprioception (depth sensitivity).132 For orientation using a measurement scale "with regard to the Figure 20 shows mobility as functional capacity. Result values of 4

[130] Saup (1993), pp. 65-66.
[131] URL: http://de.wikipedia.org/wiki/Equilibriumsense (November 20, 2013, 2:02 p.m.).
[132] See Wikipedia, keyword "Sense (perception)",
URL: http://de.wikipedia.org/wiki/Sinn_%28Wahrnahme%29 (November 20, 2013, 2:02 p.m.).

Mobility tests on people aged 70 to over 85, based on the TINETTI test133 . They are used to assess balance and coordination with regard to walking stability.134

The 360 degree rotation and the forward bending are exercises that provide information about the age-related change in the sense of balance. The rapid 360-degree rotation decreases from 82.2% to 37.5% in men aged 70 to over 85 years, and in women from 72.9% to 20.3%.

	Altersgruppe				
	70–84 Jahre		85+ Jahre		Gesamt
	Männer	Frauen	Männer	Frauen	(gewichtet)
Blindgang[1]					
ungestört	44,2	41,1	32,8	25,2	39,7
gestört	48,1	48,1	35,9	16,5	44,2
nicht möglich	7,8	10,9	31,3	58,3	16,1
Blindstand[2]					
ungestört	62,0	46,5	14,0	7,8	43,7
gestört	34,1	47,3	63,6	47,7	46,2
nicht möglich	3,9	6,2	22,5	44,5	10,0
Drehung um 360°[3]					
zügig	82,2	72,9	37,5	20,3	66,4
langsam	16,3	21,7	47,7	49,2	26,4
nicht möglich	1,6	5,4	14,8	30,5	7,2
Vornüberbeugen[4]					
vollständig	18,6	47,6	11,7	18,1	35,2
weitgehend	48,8	33,3	25,8	20,5	35,2
geringfügig	28,7	13,5	38,3	12,6	17,4
nicht möglich	3,9	5,6	24,2	48,8	10,8

1 Unterberger-Tretversuch: mit geschlossenen Augen mindestens 30 Schritte auf der Stelle treten; „gestört" bei Abweichung über 45°.
2 Romberg-Versuch: freies Stehen mit geschlossenen Augen, zusammengestellten Füßen und vorgehaltenen Armen für mindestens 30 Sekunden; „gestört" bei starkem Schwanken mit Ausgleichsbewegungen.
3 Anzahl der Schritte für Kreisdrehung auf der Stelle; „zügig": unter elf Schritte, „langsam": mehr als zehn Schritte.
4 Finger-Boden-Abstand in Zentimeter: „vollständig" = 0 cm, „weitgehend" < 16 cm, „geringfügig" > 16 cm.

Figure 20. Objective mobility by age and gender with estimates of population prevalence (Figures in %)
Source: Steinhagen-Thiessen/ Borchelt (1999)

The ability to bend forward completely decreases in the same age group in men with a decrease from 18.6% to 11.7% and for women with a decrease from 47.6% to 18.1%.

Balance performance is related to mobility and social interaction
Decreasing coordination and mobility skills mean more

133 See Tinetti (1986).
134 See Steinhagen-Thiessen/Borchelt (1999).

necessary space for the provision of aids and personal assistance. At the same time
This is associated with a reduction in social life. Studies by BASE show that
significant interaction effect that in the

> "Combination of sensory modalities (vision, balance/gait) […] people with impairments of both sensory systems showed disproportionately reduced participation in leisure activities and smaller networks."135

3.3 Potential of the room for dementia

3.3.1 Orientation potential

As previously described, the orientation deficit in the course of the disease from stages 5-6,
moderate to severe dementia, too large for independent, targeted mobility
and successful targeting of targets in rooms would be possible.

We will now take a closer look at the quality of orientation up to and including the
moderate dementia. Information about a potential existing
Orientation in the course of dementia is provided by selected studies that have a concrete reference to
planning practice. They are to be regarded as a contribution to basic research and are
Research focus *on orientation and perception in dementia* in the field of
Neurology.

The studies by LIU, GAUTHIER and GAUTHIER136 on *spatial disorientation*
in dementia show that, compared to non-demented elderly, recognition in new
environment, while – at least in the early stages of the disease – the
Recognition of space and object shape in the familiar environment is retained. This
are aspects that correspond to the classification of the REISBERG scale.

LIU, GAUTHIER and GAUTHIER came to further conclusions that
maintain some basic orientation skills in the early stages of Alzheimer's dementia
remain, namely visual outline recognition, visual and tactile size discrimination and
left-right distinction.

In the study on *wayfinding in open spaces in dementia patients,* SHEEHAN, BURTON and
MITCHELL137 found that dementia patients, compared to non-dementia patients,
get lost on the way back. On the 30-minute walks with people

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[135] Marsiske et al. (1999), p. 396.
[136] See Liu/Gauthier/Gauthier (1991).
[137] See Sheehan/Burton/Mitchell (2006).

with mild to moderate dementia, they further observed that this group had the same identified elements of their environment and followed the same orientation points (near and as the control group without dementia. SHEEHAN, BURTON and MITCHELL obtained this result, although the demented people also showed more signs of Confusion in the room and on the distance travelled comparatively from were affected by stronger negative emotionality.

The results of FOLDI et al. from the investigations on *visual-selective perception in dementia* showed that compared to the non-demented group of people, Attention capacity in dementia patients is more strongly demanded as soon as external characteristics of similarity and the stimulus density increases.138 Specifications from the The latest technical practice manuals often refer to these research results Reference, such as the requirement to avoid building density and design uniformity.

In the following, the above study results on the quality of orientation in with regard to *direction detection* and *object detection .*

quality of orientation up to moderate dementia	
direction detection	*object recognition*
Orientation by nearby markings such as non-demented people139	outlines140
Orientation at distant markers as in non-demented people141	Visual and tactile size differences142
left-right distinction143	object distribution in space144

In addition, research has included literature analyses of individual Intervention measures *(design/ structure/ tools)* were carried out in the interior construction and Equivalent measures in open spaces are qualitatively assessed. Only in very few cases are Dimensions or structural regulations are listed. The latest literature analyses are “The Therapeutic Design of Environment for People with Dementia: A Review of the Empirical

[138] See Foldi et al. (2005).
[139] See Sheehan/Burton/Mitchell (2006).
[140] See Liu/Gauthier/Gauthier (1991).
[141] See Sheehan/Burton/Mitchell (2006).
[142] See Liu/Gauthier/Gauthier (1991).
[143] See ibid. (1991).
[144] See Foldi et al. (2005).

Design” by DAY, CARREON and STUMP145 and “Making the Outside World Dementia-friendly: Design Issues and Considerations” by MITCHELL et al.146 .

3.3.2 Prevention potential

The topic of *movement in space as dementia prevention* was identified by sports medicine as alternative forms of therapy in the prevention and treatment of diseases.
Based on this research direction, Demenz Support Stuttgart published a literature general overview entitled "Exercise and Dementia" [147] This overview covers all Studies on exercise programs for dementia and classified their results drug *treatment* of dementia.

These include the studies by ABBOTT et al.148 and LAUTENSCHLAGER et al.149. They point out that regular outdoor activities combined with mental Activity such as memory exercises can have a positive effect on the course of dementia if they are carried out before outbreak of symptoms. In addition, the authors point out the apparent tendency that exercise programs improve cognitive functions with progressive support old age.

It should be noted that these study results are not included in the practice guideline *S3 guideline - dementias* were included. This guideline provides guidelines for the medical Diagnosis and therapy of dementia and is supported by the German Society for Neurology and the German Society for Psychiatry, Psychotherapy and Neurology. However, it also states:

> "There is evidence that physical activation contributes to maintaining everyday functions, mobility and balance. It can be offered." [150]

3.3.3 Socially integrative potential

For the area of *space & city & health,* the socially integrative potential of space for seniors and people with dementia. In the general discussion, questions are asked such as The following: Does the public space in our cities guarantee space for movement, social Interaction and well-being? Or: Does the living environment meet the needs of seniors

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[145] See Day/Carreon/Stump (2000).
[146] See Mitchell et al. (2003).
[147] See Demenz Support Stuttgart (2008).
[148] See Abott et al. (2004).
[149] See Lautenschläger et al. (2008).
[150] DGN/DGPPN (2009), p. 38.

And further: Will the senior citizens be able to use the public open space that has been offered so far supported to lead a largely independent and self-determined life in old age?

In this context, it is important to promote intersocial communication and contact with the environment – through throughout the dementia – as far as possible. Families demand for their affected relatives an appropriate living environment so that they can achieve psychosocial experience relief.

BECKWITH describes this need in her article *The Paradise Garden: A Model Garden Design for Those with Alzheimer's Disease* as a utopian ideal.

> "Nature is the continuum that offers a restorative relationship. When everything else is in turmoil, particularly for individuals with Alzheimer's disease and their spouses and families, the garden offers peace, tranquility and quiet fascination." [151]

As part of *Horticulture Therapy* (HT), a collaboration between geriatric care and Horticulture, the design of the outdoor areas is facility-related with garden-oriented milieu therapy. Here, HT is given a special status in the area of inpatient long-term care.[152]

The expansion of social, therapy and exercise spaces by relocating from The transition from indoor to outdoor areas means a significant change for the specialist and nursing staff. therapeutic framework of a new dimension. This gives a broader field of action and a greater scope for interaction in his care work. With regard to the However, general acceptance of new planning projects should be ensured that outdoor areas are easily accessible for demented walkers and wheelchair users. A staff survey revealed that in the case of difficult access to a site is less frequented. Long distances, according to the staff, take that time which is then no longer available to other residents in the care process. [153]

These are examples of experiences of nursing staff or dementia assistants who Can provide information about a desired spatial function – with the aim of a socially integrative living and organizational environment for seniors and people with dementia.

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[151] Beckwith (1997), p. 15.
[152] See Stein (2007).
[153] See Rappe/Topo (2007).

3.4 Space as a compensation strategy for dementia

3.4.1 Time and place contextualization

With regard to the person-environment relationship, clearly defined building and
To establish design principles to facilitate the cognitive estimation of spatial dimensions
by the residents up to moderate dementia. As already mentioned in chapter
As described in 4.1.3, this is done by means of 4 successive decision-making processes. In
In terms of memory performance, the complex
The decision-making processes that have been built up are the first to disappear.

Cognitive estimation of spatial dimensions	
in non-demented people	*in Alzheimer's dementia seniors*
(1) to stay or to go (2) to take a direction (3) to take the exact path (4) how do I want to get there[154]	 More complex Decision processes such as (3) or (4) are eliminated

Referring to this orientation process, ÖRLUV describes a general communicative bridging strategy for dementia patients. It is an attempt to establish a place-time
Contextualization, in which the demented person identifies the here and now
attempt:

> "[They] ask (1) about the 'lost' time/life, (2) they ask about the present situation and (3) about what happened in between."[155]

For planning purposes, the question arises as to how to find solutions for connecting to the temporal
and spatial now level.

place-time contextualization	***Finding a connection to the temporal and spatial now level***
(1) Question about "lost" time	ÿ Moments for reminiscence

[154] See Cadwallader (1976).
[155] Örulv, 2010, p. 39.

(2) Question about the current situation	ÿ Sensory stimulus as contact to temporal now level
(3) Question about what happened “in between”156	ÿ Maintaining a consistent concentration levels

The dementia patient needs spatial tools to overcome longer distances – from where he first *takes note of only one thing with immediate attention* – to to be able to trace its original direction and intention.

In addition to the communicative connection, a structural connection is also needed.

In accordance with the decision-making processes, the following target criteria should be mentioned: Moments of recollection, sensory stimulus as a contact point to the temporal now level, Maintaining a consistent level of concentration.

3.4.2 Open spaces as sensory and social stimulus

The approach of using open spaces as a sensory and social stimulus has its origins in the design of pediatric facilities. From the 1990s onwards, this Planning orientation in the form of – generally so called – dementia gardens moving into Nursing homes. This was followed by an increased publication of general planning aids and Recommendations for employees of gerontological institutions for the redesign of Open spaces involving dementia patients, for example the KDA brochure “Gardens for people with dementia” by POLLOCK157 and the book with the same title “Gardens for people with dementia” by BENDLAGE et al.158 .

In developing reference models for improving the quality of the living environment of The *door opening concept* is crucial for dementia patients both indoors and outdoors . was introduced by Willi Rückert from the German Ageing Assistance Board (KDA), Cologne. What is meant by the concept is that by means of a *key* a new contact to the personality of the person suffering from dementia. This approach places the dementia patient as a person at the centre.159

156 See ibid. (2010).
157 See Pollock (2007).
158 See Bendlage et al. (2009).
159 See Powell (2000).

Accordingly, open spaces as a perceptual space can also be described as a kind of *key* .
According to STIGSDOTTER and GRAHN160, contact with nature
The remaining resources of the patients are reached. Natural areas require the participation of the sick person. And this involvement includes sensorimotor involvement.

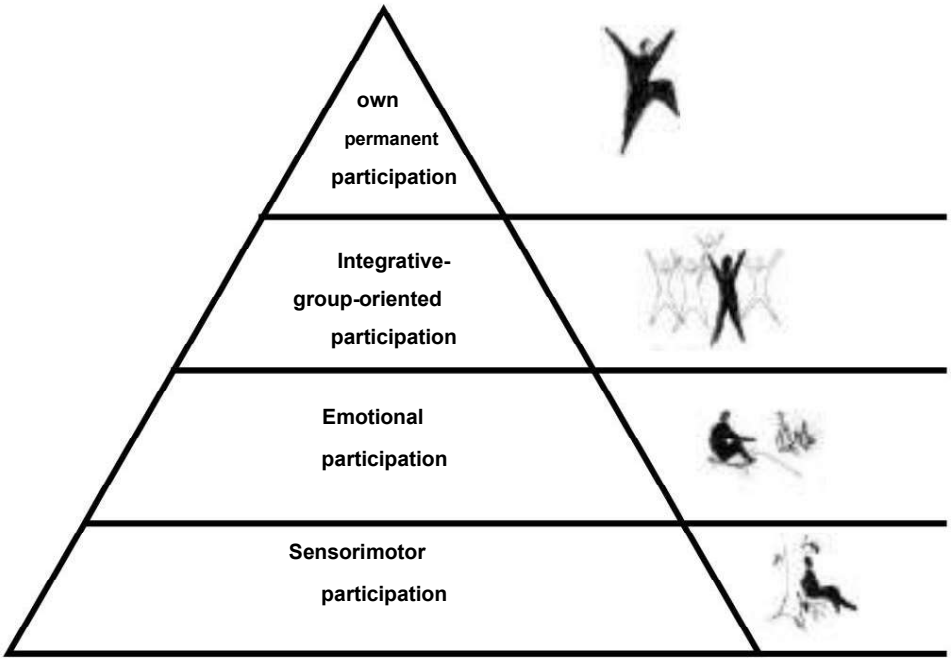

Figure 21. Forms of possible participation in open spaces.
Source: Teimann, modified from Stigsdotter (2002).

GIGLIOTTI161 sees positive effects of garden therapy programs on the course of dementia. These effects are seen as constructive involvement of the Person in the overall event and on the other hand as the person's pride in their own mastered Performance is described. In general, an improvement in the night-day rhythm can be observed with increased UV radiation. In addition, CALKINS162 has A study on the extended stay of dementia patients in open spaces indicates that this leads to Improvement of sleeping habits in dementia patients, just as challenging behavior is reduced. Concrete application programs and an introduction The latest book “Nature-Based Therapy” for people with dementia offers Dementia by CHALFONT163 . There are measures for sensorimotor stimulation and perception of nature.

[160] See Stigsdotter/Grahn (2002).
[161] See Gigliotti (2004).
[162] See Calkins (2007).
[163] See Chalfont (2010).

3.4.3 Reduction of agitation through migratory behavior

Agitation (also: agitation) is described in medicine as a pathological restlessness that leads to violent and hasty movements of the patient.[164] This includes Restlessness and agitation as well as hyperactivity. According to the *S3 guideline on dementia ,* Hyperactivity is further referred to as an empirically identified symptom cluster consisting of the Symptoms include agitated behavior/aggressiveness, euphoria, disinhibition and psychomotor Restlessness exists. The symptoms do not always occur together in each patient. The classification is made in medicine for the purpose of medicinal Treatment recommendation. Treatment should only

> "[…] should be considered when all possible environmental and communication modifications have been made and all available psychosocial interventions have been used."[165]

For those affected, the wandering behaviour is a motor outlet for their psychomotor Unrest. In the interiors of the outpatient and inpatient facilities, this is difficult manageable tendency included in the daily and nightly care routine.

LIND166 summarizes in "Dealing with dementia – scientific basis and practical Methods" the previously described migratory tendencies of Alzheimer's dementia as follows together:

(1) Wandering increases as the mental deterioration process progresses.
(2) Walking is a reaction to partly inadequate environmental and social factors, which sometimes cause anxiety, stress, strangeness and boredom in dementia patients.
(3) Migration behaviour also partly reflects personality-related behavioral structures.

This leads to the guiding principle for intervention measures not to prevent hiking, but, on the contrary, to address hiking therapeutically in such a way that physical activation is increased through spatial structures and care offers such as hiking trails and hiking programs and the negative aspects of this behavior such as getting lost, getting lost and falling are reduced.[167]

At the end of the 1970s, this form of hyperactivity was already being studied in more detail. It should be noted that hikers differ from non-hikers in the duration of their journey differ, hikers move on average 32% of the day, non-hikers

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[164] See Wikipedia, keyword "Agitation (medicine)", URL: http://de.wikipedia.org/wiki/Agitation_%28Medizin%29 (16.12.2013, 13:11h).
[165] DGN/DGPPN (2009), p. 33.
[166] See Lind (2000).
[167] See ibid.

only 4%, hikers are significantly more often alone than non-hikers and hikers
already practiced the behavior of reducing stress through exercise in their life phase before the onset of dementia.168

In the early 1990s, HOPE et al.169 attempted to investigate migration trends in more detail.
and identified types of migratory behaviour. The most common were the
Identify typologies 9 = *Running away* and 3 = *Aimless wandering .*

Typologies of migration tendencies according to HOPE	
1. Control hike	During *control walking,* the dementia patient is looking for his reference person.
2. Tinkering around *Pottering*	The dementia patient moves around the garden or the house to pursue certain activities – mostly unsuccessfully.
3. Aimless wandering	Here the person wanders without any apparent destination or specific purpose.
4. Hiking with an inappropriate goal	The person suffering from dementia is searching for a target that is no longer real, such as a deceased family member.
5. Hiking with appropriate goal, but inappropriate frequency	The patient has a very real goal, e.g. a single store in the neighborhood, but he wants to shop there inappropriately often, e.g. six times a day.
6. Extremes migratory behavior	The affected person is constantly on the move, almost without a break or interruption.
7. Nighttime wandering	Nighttime wandering occurs due to the disturbed day-night rhythm.
8. Need to be brought home	In this case, the dementia patient has become lost in the living environment and cannot find his way back without help.
9. Running away	The affected person makes attempts to leave the house without any obvious cause or rational reason.

When looking at the many forms of migratory behaviour, it becomes clear which
compensatory function of the space in dementia hyperactivity. The
The accessibility of space is ultimately the *stress relief* and - depending on the use of structural Measures *to regulate mobility* in open spaces.

[168] See Snyder et al. (1978).
[169] See Hope/Fairburn (1990) and Hope et al. (1994).

4 Free Spaces for Dementia and Alzheimer's Dementia

4.1 Classification of the typologies used so far

In the last 7–10 years, a new trend has emerged in the field of landscape architecture.
Planning area for the construction of stationary nursing homes has emerged. As part of the
During this period, there were numerous outdoor space planning projects for people in need of care.
Publications on the subject of dementia gardens, and the Stiftung Wohlfahrtspflege NRW published the working paper “Qualitative Gardens” (2010)[170] for people with dementia
out of here.

Three basic principles of planning are highlighted in these publications:
Principle of *endless paths,* the principle *of theme gardens* based on sensory science and the principle *Adaptation* of space and surfaces to the movement patterns of dementia patients.[171]
In terms of content, the focus was primarily on occupational therapy and
sensory open space offering with safety standards.

The following are open spaces of up to 1600 m² in size, which were created between 2002 and 2006
were built in NRW, typologically examined. Different types of road access
are assigned to different orientation and decision levels using a scale.
The result is a classification of the design of the open spaces, which is based on the
A new evaluation of drafts is carried out with regard to the question
what added value a certain type of open space has for the residents in the different
can have phases of dementia.

Due to their different shapes, 30 open spaces were
Six basic patterns have been selected as examples. They are described in detail in Chapter 5.3 (Typologies 1-6) are treated.

[170] See URL: http://www.sw-nrw.de/fileadmin/user_upload/Redäre/foerderung/Neues_Garden paper_status_July_2011.pdf (27.12. 2013, 21:53h).
[171] See Regulation on Barrier-Free Construction, DIN 18024-1 and DIN 18025; URL: http://nullbarriere.de/din18040-1-terms.htm#cognitive (15.11.2013, 11:07h).

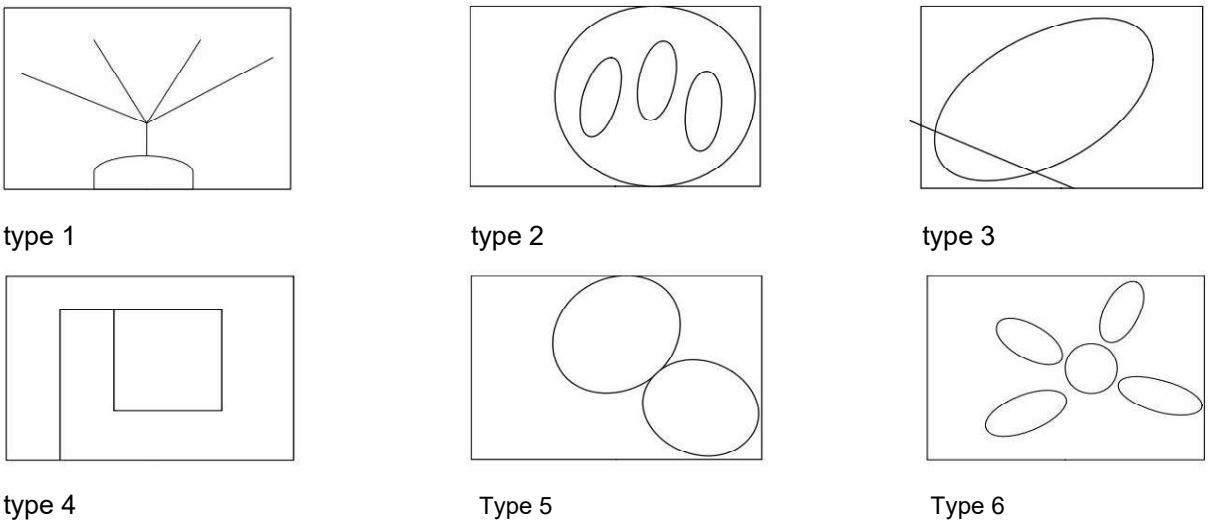


Figure 22. Basic pattern overview of 6 open space typologies.
Source: Teimann

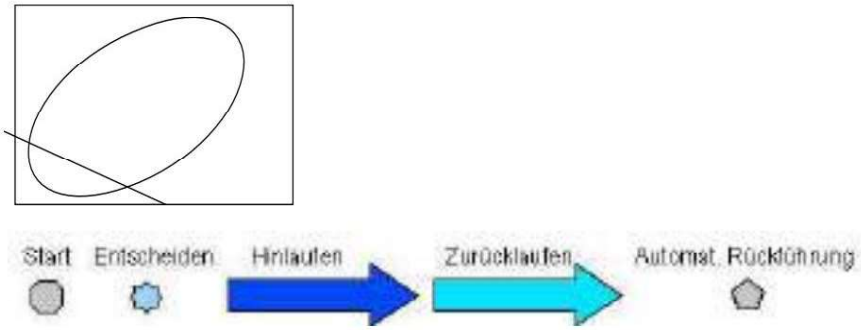
type 1	Mobility impulses through non-concentric spatial division
type 2	Subdivision into concave-round shapes for a higher decision level
type 3	Low-threshold fitness requirement through different room levels
type 4	Image of a traditional landscape for readability and orientation
Type 5	Reclining Eight with High Accompaniment Support
Type 6	Sanatorium-atmospheric spatial density for a positive mood

4.2 Structural parameters

The compilation of planning components *automatic feedback, insight and Building density* determines the level of orientation and decision-making of the residents in practice. This aspect is taken into account when considering the selected typologies evaluated.

In open space planning, there is talk of automatic repatriation when the The route is circular and one-way. It is a prerequisite for the residents take a predictable mobility direction, which in the course of time can be hit again by him. The automatic return is thus characterized by path systems leading from the accommodation location to the outside area and are then returned to the accommodation location. This can be seen on the type 3 This can be seen in the illustration of example 1 (type 3).

Example 1. Predictable mobility direction (type 3)



If, however, automatic repatriation is not possible, the resident can – as the

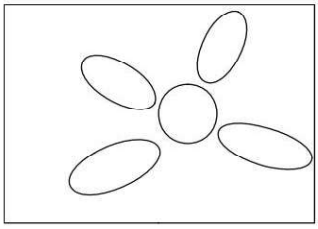
Example 2 (Type 6) shows that the system does not automatically return to the starting point. If this is exactly what

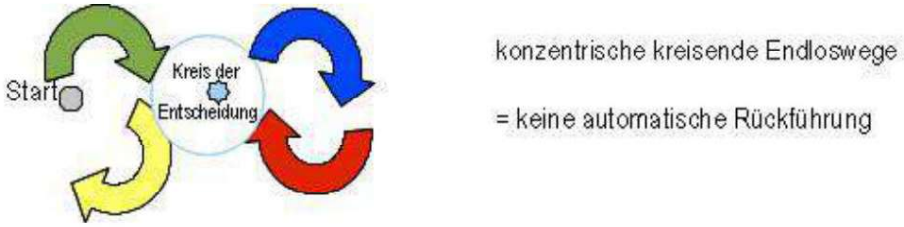
If this is desired, this can be consciously planned. However, it is

Consider that the resident with increasing cognitive impairment on

will be dependent on accompanying assistance.

Example 2. No predictable mobility direction (Type 6)





The physiological aging process impairs spatial perception.

The following figure shows the average field of view for vertical visual tasks

In planning for old age, the primary focus should be on the optimal

Visual angle range 3 must be taken into account. The restriction of the visual field is accompanied

with the loss of visual acuity, contrast sensitivity, visual light-dark

adaptation and spatial vision. [172]

[172] See Steinhagen-Thiessen/Borchelt (1999).

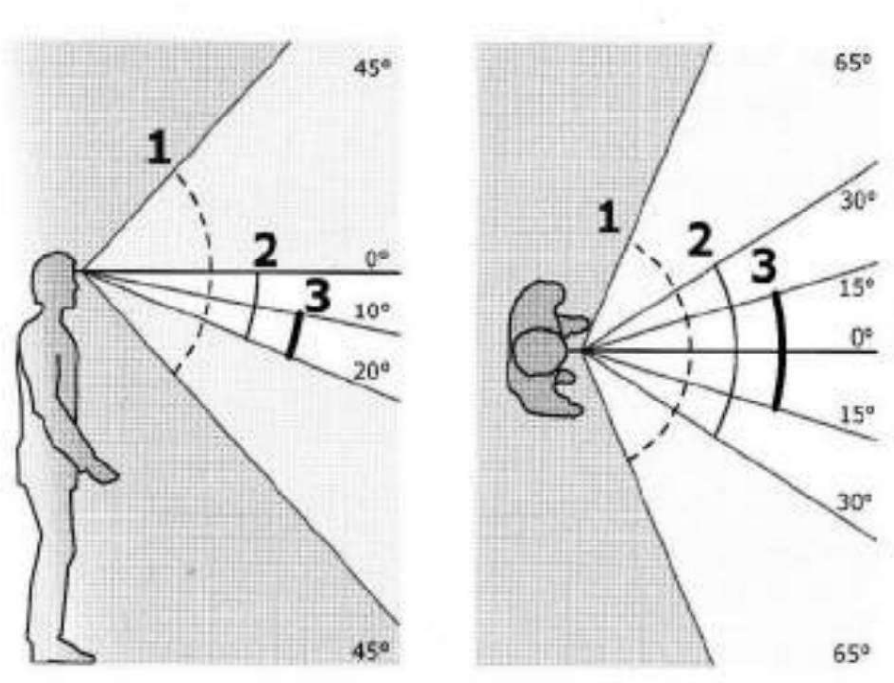


Figure 23. Gaze areas for vertical visual tasks: (1) maximum, (2) preferred, and (3) optimal visual space.

Source: Rau (2011)

If a largely independent mobility is desired for the residents, the room should have a have high visibility, which, however, requires a low building density. Figure 24 shows a low visibility at high building density due to vegetation. In Figure 25, however, it can be seen that a low building density for the dementia patient has a higher This means safe entry into the – for him unknown – area.

Figure 24. Low visibility with high building density/ high vegetation Source: Teimann

Figure 25. High visibility with low building density

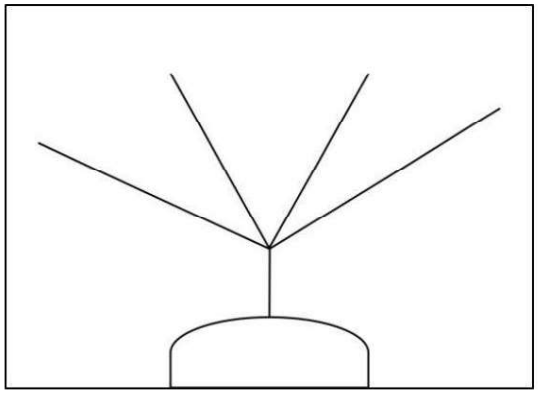
Source: Teimann

4.3 Typologies 1-6

In the following, the exemplary conception types are described in detail according to a) design data, b) description and c) viewing directions, mobility history and cognitive Requirement in relation to the building structure.

4.3.1 Type 1 – Mobility impulses through non-concentric spatial division

a) Type 1 – Design data



Principle:	linearly aligned control points
General orientation level: high	
shaping:	branching
Room layout:	splitting in one direction
Local character:	industrial-urban character
Population of the town:	270,000
Year of construction of the system:	2000
area size:	800 m²
Alignment:	connected to the dormitory, with access to the street
Resident places:	90, including 45 places for people with dementia
Concept:	dormitory
dormitory:	Marien-Linde nursing home
Carrier:	parish of St. Joseph and Corpus Christi
Location:	Aachen

b) Type 1 – Description

Figure 26. Outdoor area of the Marien-Linde nursing home, Aachen.
Source: Teimann

In 2000, the operator of the Haus Marien-Linde nursing home in Aachen built a
Based on a concept of its own, an outdoor area for the residents. In the inner city area
In Aachen, the concepts for the construction of inpatient nursing homes traditionally focus on
social encounters; they are less oriented towards the activity needs of seniors
within green spaces. The background to this is the social-industrial environment of the
inner-city structure, in which gardening activity is less popular in old age than
social exchange in a social environment with gastronomic service.

The garden of the Marien-Linde nursing home is primarily used as a quiet place to stay
for small groups and also used for seasonal festivities. Four
laid out paths lead the residents to a gastronomically operated banquet hall,
a pavilion, a daycare center, a sun hall and a seating area consisting of several
benches (see the following sketch under 1, 3, 4, 5 and 6). Within the non-concentric
The path system, which is not a typical circular route,
particularly emphasized.

The linear and branched path system of the 800 m² property was
after completion of the garden, adapted to the adjacent building structure. The path
is about 200 m long, the path is 1.3 m wide. No handrails have been installed, as the use
of the garden is primarily geared towards mobile independence. The 4 target locations
provide clear mobility impulses right from the start.

c) Type 1 – Recording of gaze directions, mobility progression and cognitive demands

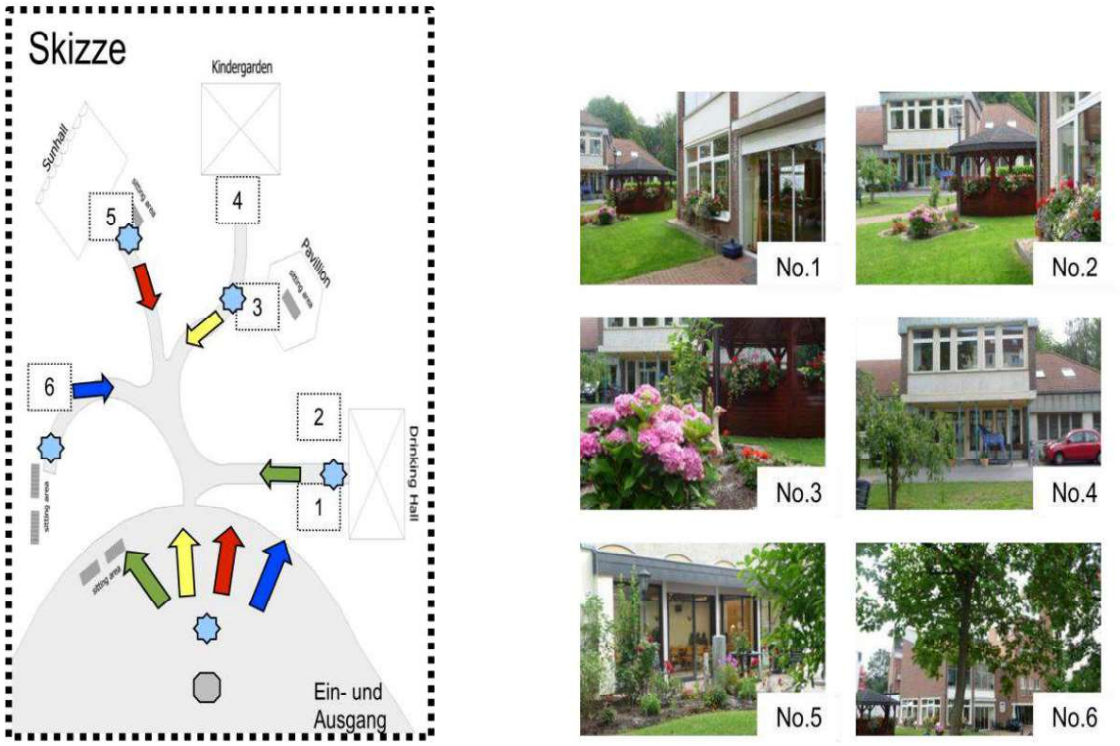


Figure 27. Gaze directions – Type 1.
Source: Teimann

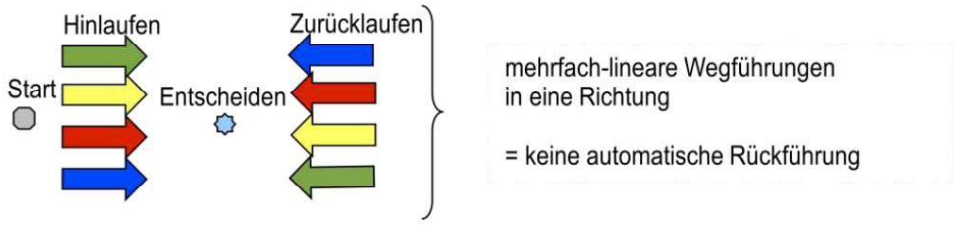


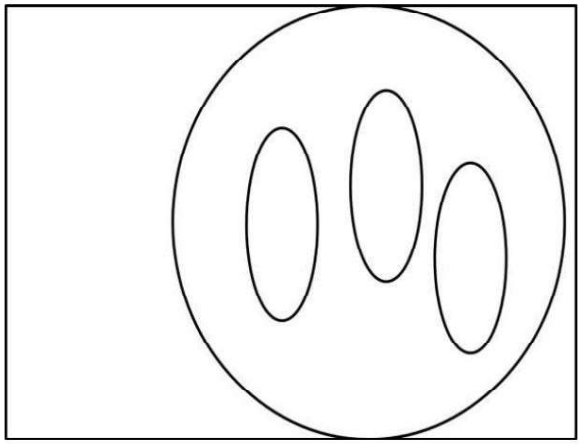
Figure 28. Mobility trajectories – Type 1
Source: Teimann

Conceptual type 1 *Mobility impulses through non-concentric room division* is based on a multiple linear arrangement of the route. The decision level for the The ability to choose a direction is the highest compared to the other systems. There is no automatic return. The resident has to re-enter the Access to the other end destinations – such as the ballroom, pavilion, sun hall and bank area – freely selectable. The high visibility and the low building density promote spontaneous Impulse to enter the facility directly and navigate independently from place to place. This type is optimal due to the high cognitive demands on the affected person from Pre-phase of the disease up to mild dementia with high mobility.

Result: Decision level: 5, Insight: 5, Building density: 1 and automatic Feedback: none; *on a scale of 1-5 (1=low; 5=high)*

4.3.2 Type 2 – Subdivision into concave-round shapes for a higher decision level

a) Type 2 – Design data



Principle:	interlocking circular routes for independent mobility
General orientation level:	high
shaping:	round-concave
Room layout:	multiple, open to loose
Local character:	rural character
Population of the town:	50,000
Year of construction of the system:	2001
area size:	1600 m²
Alignment:	Access through building complex; concentric location between residential units
Resident places:	148, of which 63 places are for people with dementia
Concept:	dormitory
dormitory:	Elisabeth-Trombock-Haus
Carrier:	St. Franziskus Foundation Münster
Location:	Ahlen, Westphalian Münsterland, Warendorf district

b) Type 2 – Description

Figure 29. Exterior of the Elisabeth-Trombock-House, Ahlen.
Source: Teimann

The outdoor area of the Elisabeth-Trombock-Haus in Ahlen was designed in 2001
It is one of 2 existing dementia gardens and is directly connected to the residential building
The open space is characterized by its round-concave basic structure. The special feature
consists of a paved area with a rounded lawn, from which
The path is 1.6 m wide at its narrowest point and extends
with a total length of approx. 200 m.

A circular path with a clear automatic return path, typical for a dementia garden, is not provided here.
However, most of the recommended dementia garden elements
These include water areas, small animal enclosures, shade-providing devices,
Raised beds and handrails on stairs. These construction objects are located in the 1600 m²
area evenly distributed.

The composition of the garden elements also works with the organically composed
The basic form of the complex is well proportioned when entering the garden. In this way, the
Attention of residents with mild dementia and high mobility always
once again drawn to horticultural details.

c) Type 2 – Recording of gaze directions, mobility progression and cognitive demands

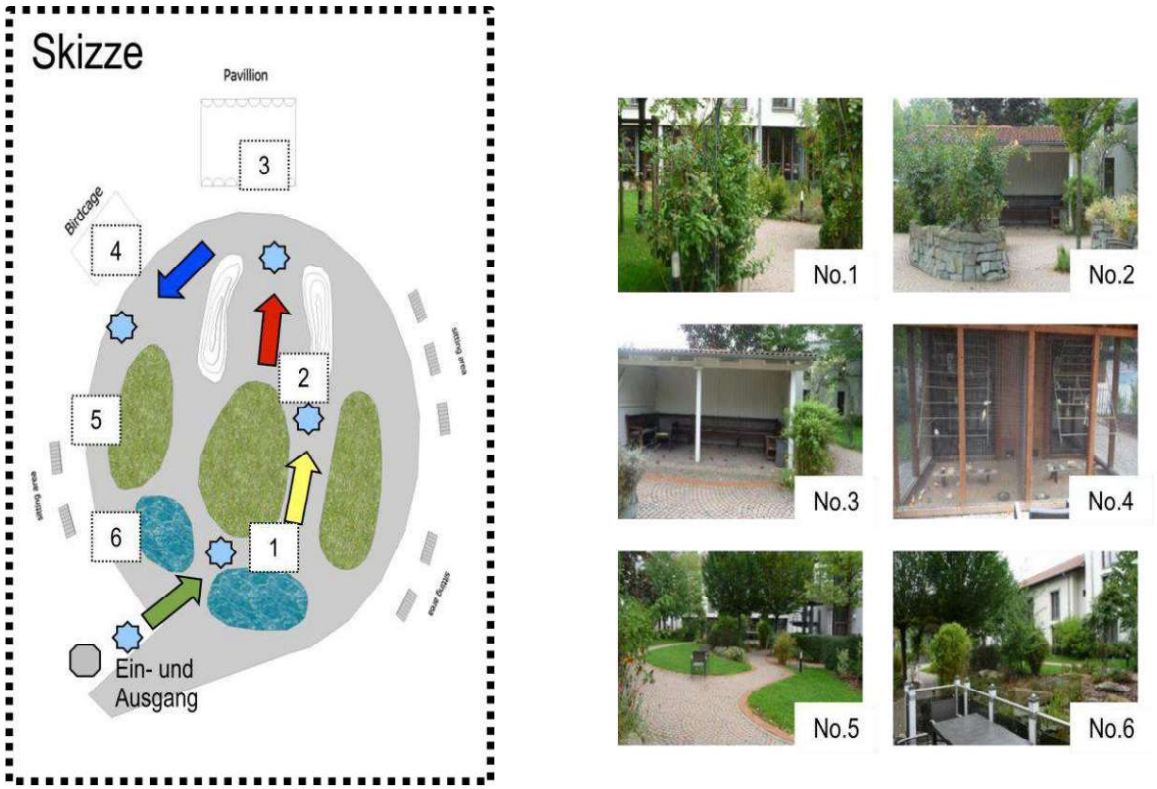


Figure 30. Gaze directions – type 2.
Source: Teimann

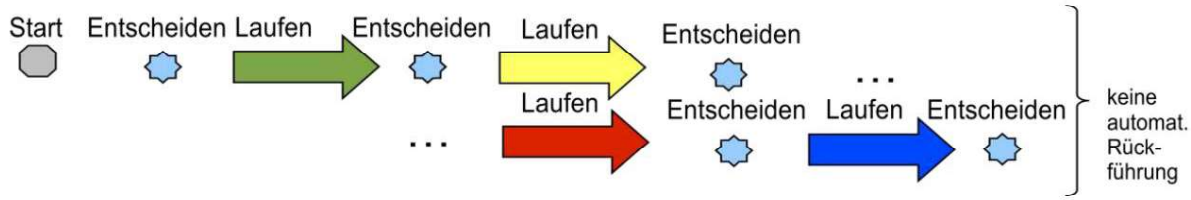


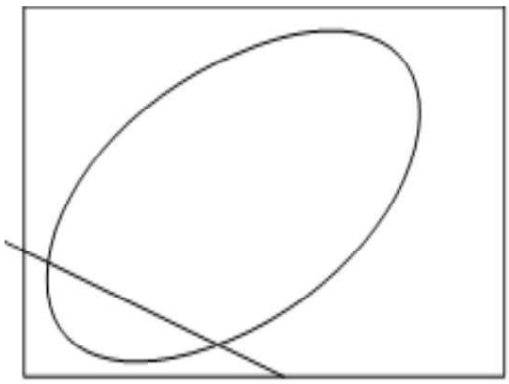
Figure 31. Mobility trajectories – Type 2.
Source: Teimann

The conception type 2 *subdivision into concave-round forms for a higher Decision level* is with its relaxed spatial structure and high visibility can be described as balanced. Active running along the route with relatively few handrail aids require a relatively high degree of mobility of the residents Since the automatic return of a typical concentricity is not possible, The residents' ability to orientate themselves is not yet significantly impaired. Numerous positioned components offer very close-spaced optional This concept is therefore mainly used for light to medium Dementia with high mobility is indicated.

Result: Decision level: 4, Insight: 4, Building density: 2 and automatic Feedback: none; *on a scale of 1-5 (1=low; 5=high)*

4.3.3 Type 3 – Low-threshold fitness requirement due to different room levels

a) Type 3 – Design data



Principle:	circular trail on a slightly sloping hillside
General orientation level:	medium
shaping:	concave
Room layout:	centrist
Local character:	rural character
Population of the place:	21,000
Year of construction of the system:	2006
area size:	900 m²
Alignment:	adjacent to the back of the dormitory
Resident places:	73, including 43 places for people with dementia
Concept:	dormitory
dormitory:	St. Josef Senior Center
Carrier:	Catholic parish
Location:	Windeck, Dattenfeld, Rhein-Sieg district

b) Type 3 – Description

Figure 32. St. Josef Senior Citizens' Center, Windeck.
Source: Teimann

In 2006, the St. Josef Senior Citizens' Centre in Windeck laid the first step towards the design
Its dementia outdoor facility has a circular path system. This was, so to speak, the
"Laying of the foundation stone" of a 900 m² garden on a slight slope. Seating groups, planting hills,
Greenhouse and flowerbeds were gradually built with little financial outlay under
Participation of the residents. Against the agricultural background of the town of Windeck,
The planting, at the request of the residents, mainly consists of cultivated plants such as cabbage,
Bush beans, marigolds and autumn asters. Rabbit hutches are
There are also animal enclosures. The small animals are partly cared for by the residents with dementia
self-catered. The seating groups positioned along the circular path are very varied
It includes wooden seating elements, individual chairs and benches as well as a
striped beach chair. Security is ensured by a clear property fence and a
Circular route with automatic return.

In its entirety, the circular path is about 130 m long and 1.2 m wide. The garden can
Despite the slight slope, with various aids such as walking frames, rollators and
Wheelchair access is possible. To start the walk on the slope, a fitness factor
as the residents with and without aids face a low-threshold physical
Performance requirements are set. The alternation of light physical tension through
The mobility on the slope to the subsequent moments of relaxation at rest places is in this
Garden area is a special feature.

c) Type 3 – Recording of gaze directions, mobility progression and cognitive demands

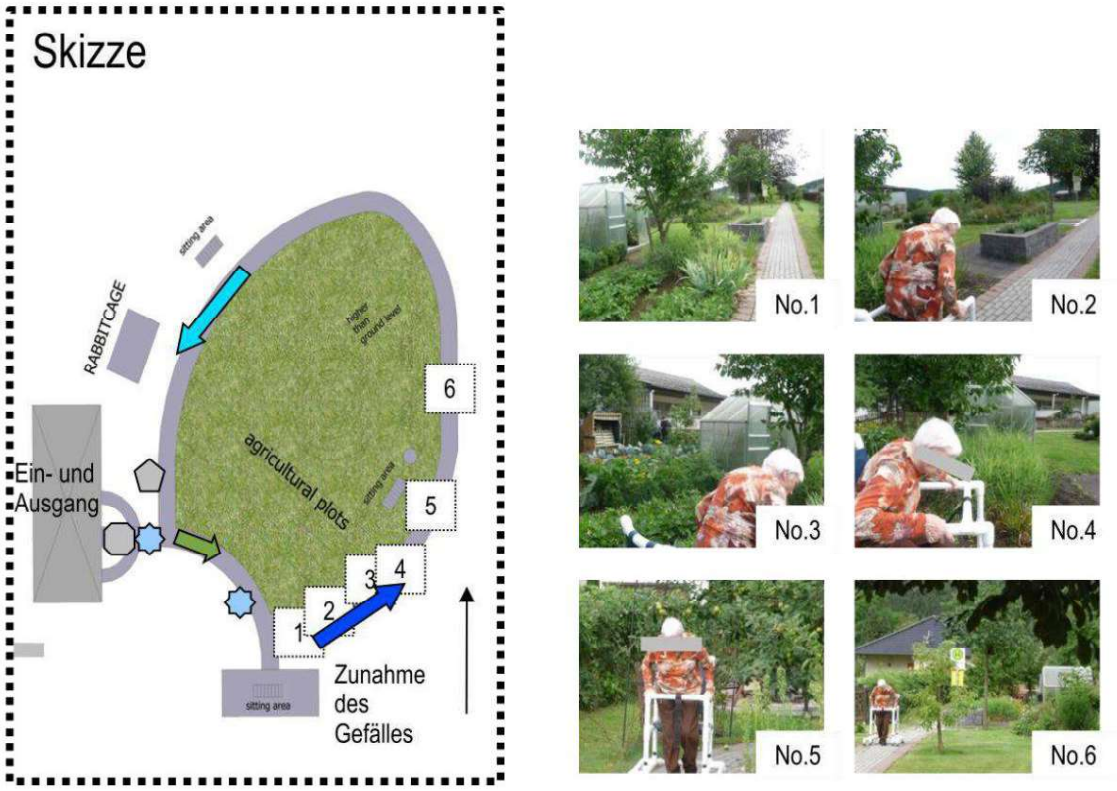


Figure 33. Gaze directions – type 3.
Source: Teimann

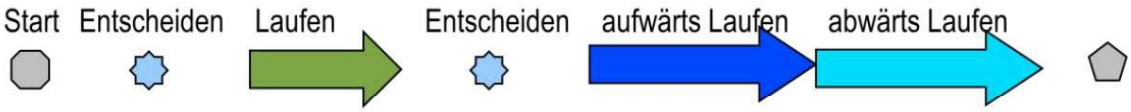


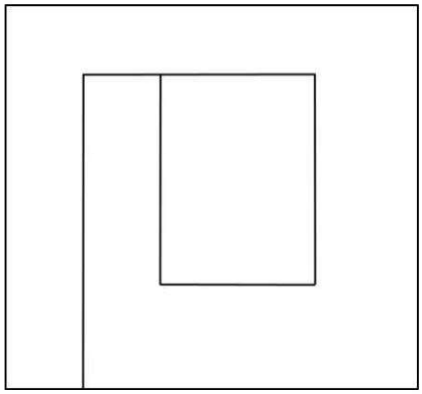
Figure 34. Mobility trajectories – Type 3.
Source: Teimann

Conception type 3 *Low-threshold fitness requirement through different Room level* is facilitated by a slight slope of the terrain. Walking on a slightly Sloping or rising ground represents an additional challenge to be overcome Performance requirements. Building density and visibility are set low here, as is the Decision level due to hardly any branching options. In addition, It should be noted that due to the automatic return, there is no very high Orientation skills are required from the residents of the complex. This type of design is suitable for mild to moderate dementia; a fitness requirement with and without Aids are also covered.

Result: Decision level: 2-3, Insight: 2, Building density: 2-3 and automatic Feedback: present; *on a scale of 1-5 (1=low; 5=high).*

4.3.4 Type 4 – Image of a traditional landscape for readability and orientation

a) Type 4 – Design data



Principle:	thematic imitation of the traditional environment
General orientation level: low to medium	
shaping:	right-angled, directed inwards
Room layout:	simple straight-line subdivision
Local character:	rural character
Population of the town:	11,000
Year of construction of the system:	2006
area size:	1000 m²
Alignment:	adjacent to the rear of the dormitory
Resident places:	85, including 24 places for people with dementia
Concept:	Landscape architect T. Wilken, Harwicks-Beck
dormitory:	Nursing Home Foundation of Saints Fabian and Sebastian
Carrier:	Catholic retirement homes of the Diocese of Münster
Location:	Rosendahl-Osterwick

b) Type 4 – Description

Figure 35. Nursing Home Foundation of Saints Fabian and Sebastian, Rosendahl-Osterwick.
Source: Teimann

The Nursing Home Foundation of Saints Fabian and Sebastian in Rosendahl-Osterwick built 2006, an outdoor facility for residents with dementia. The planning was carried out by the Landscape architects Wilken. The conceptual peculiarity of the design is the landscape imitation of the traditional landscape. In this case it is the Münsterland region, for which extensive cycle paths between the villages are extremely typical. On the edges of these paths the following landscape elements are to be found: straight hornbeam hedges, edging boxwood plantings, Madonna Figures, rose arches and the characteristic bridge crossings. In the dementia garden of the The regional character is emphasized by carefully positioned objects such as Wooden barrels, washboards and large wagon wheels underlined the atmosphere. What was once familiar to people in their environment, they find in the outside space of 1000 m². Curved branches were avoided when developing the path. It is concisely straight and has a direction that is determined by the structural dementia area and back to it. The paths are about 1.7 m wide and a total of 300 m long. Handrails are only present in the area of the bridge crossing. It turns out that the concept, which is based on the traditional landscape, on the need for clear readability, Orientation and open insight, thus providing residents with advanced disease progression requiring mobility support.

c) Type 4 – Recording of gaze directions, mobility progression and cognitive demands

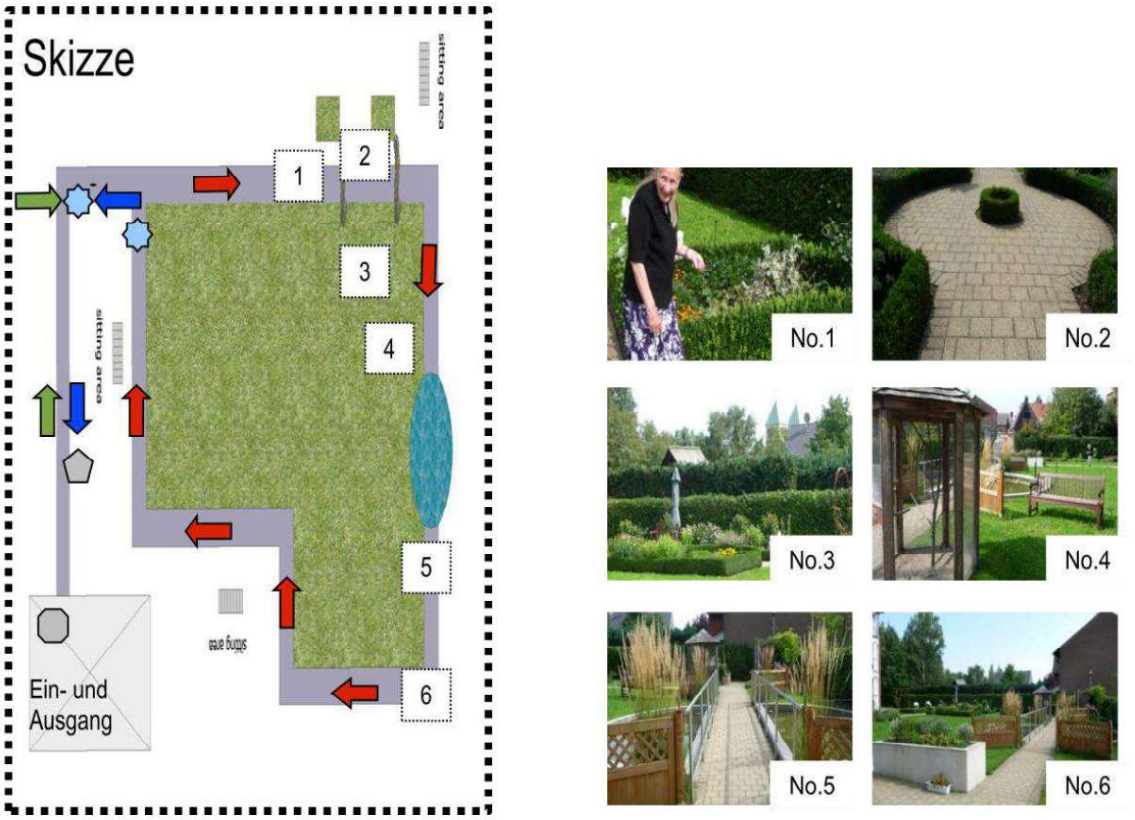


Figure 36. Gaze directions – type 4.
Source: Teimann

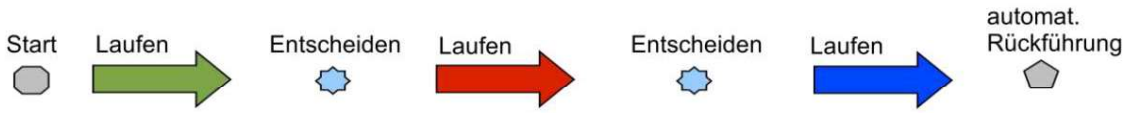


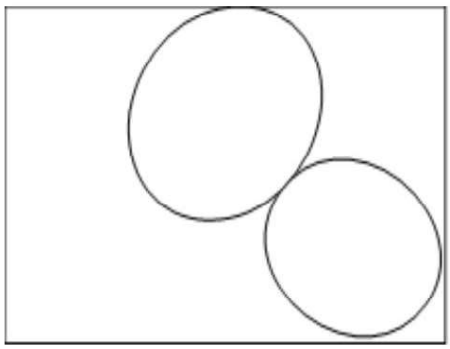
Figure 37. Mobility trajectories – Type 4.
Source: Teimann

The conception type 4 *image of a traditional landscape for readability and orientation* imitates landscape and atmosphere, the traditional environment characterized by cycle paths in the Münsterland. A largely unobstructed view, a straight path and a automatic return lead to the resident entering the facility being subjected to a The familiar shape of the elements, the The atmosphere and the absence of handrails on the main path make this Planning type predestined for a dementia-appropriate need for exercise accompanied – and This also applies when the disease is at an advanced stage.

Result: Decision level: 2, Insight: 2, Building density: 3 and automatic Feedback: present; *on a scale of 1-5 (1=low; 5=high).*

4.3.5 Type 5 – Figure Eight with high accompaniment support

a) Type 5 – Design data



Principle:	clear form with guiding guidance
General orientation level:	low to medium
shaping:	round-concave
Room layout:	simple on the vertical, with many horizontal levels
Local character:	urban character
Population of the town:	580,000
Year of construction of the system:	2005
area size:	1000 m²
Alignment:	Access through building complex, connected to other natural green areas
Resident places:	209, of which 65 places are for people with dementia
Concept:	landscape architect R. Bendlage
dormitory:	Sana Senior Center Haus Gallberg, Düsseldorf
Carrier:	Sana Clinics, Ismaning
Location:	Düsseldorf, Gerresheim district

b) Type 5 – Description

Figure 38. Sana Senior Center, Düsseldorf.
Source: Teimann

The Sana Senior Center Haus Gallberg in Düsseldorf set up a dementia garden in 2005. Concept of the landscape architect Bendlage. The basic shape of the approx. 1000 m² large The outdoor area is a figure of eight. The figure of eight is the result of the continuous pond curve and the other from the curve of a knee-deep hornbeam hedge (see following sketch under 4). In the horizontal planning space, further levels of vegetation heights intended, for example through Miscanthus grass and Bamboo plantations. Due to the high growth of these plants, the viewing area in divided into different sub-areas.

The tour on a path with an average width of 1.4 m leads around the pond complex which is surrounded by a continuous handrail. Care was also taken to that the garden access offers security. The entrance area is accessed via steps and is supporting handrails. Due to the extremely clear routing through The design *(figure eight)* is the garden with its relatively long Distance for people with a higher severity of dementia and lower For accompanying persons, the facility offers surprisingly emerging niches, rest points and new perspectives. This is an essential focus of this garden and is based on the fact that from the outset the proportions of the Basic structure through a figure eight a deliberately stylized spatial division was created.

c) Type 5 – Recording of gaze directions, mobility progression and cognitive demands

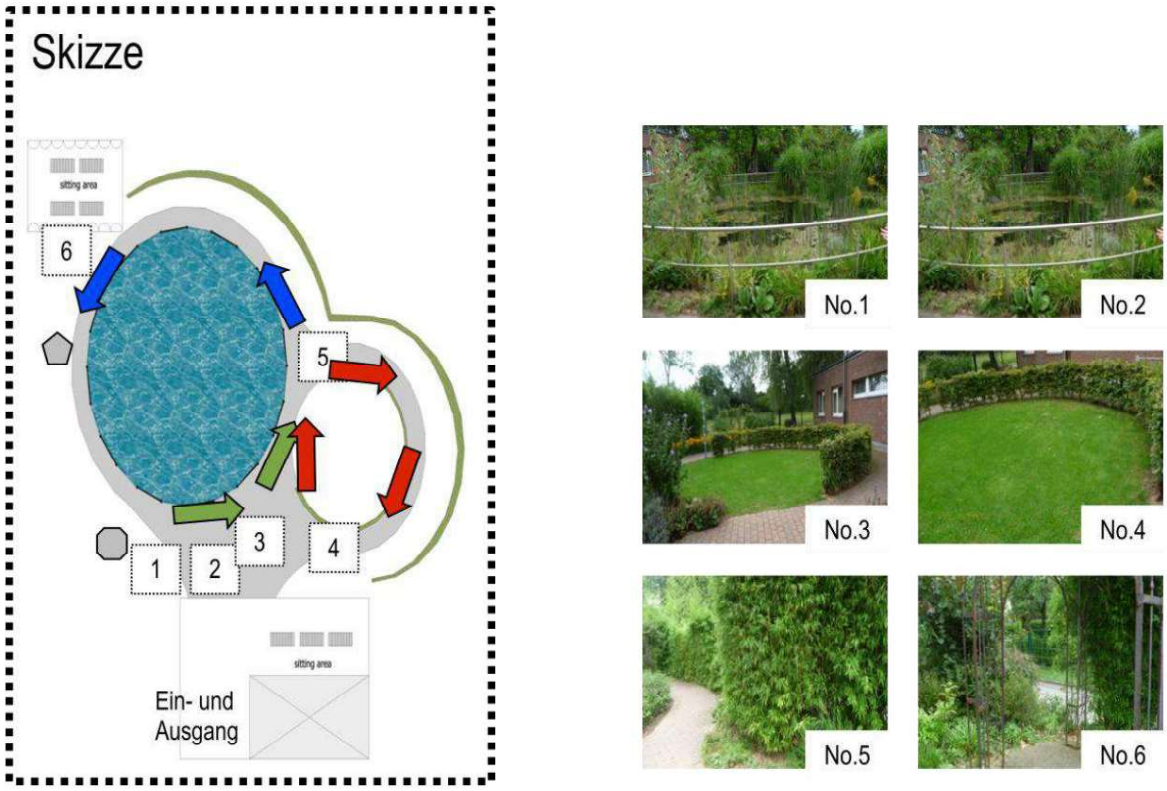


Figure 39. Gaze directions – type 5.
Source: Teimann

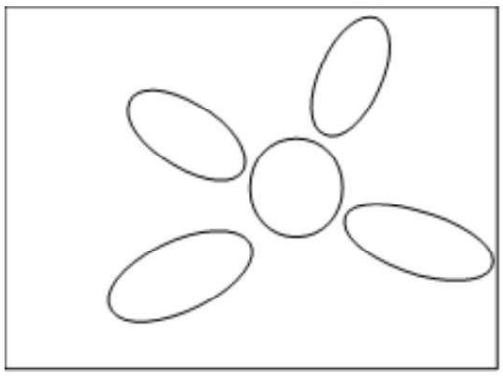
Figure 40. Mobility trajectories – Type 5.
Source: Teimann

The conception type 5 *Reclining Eight with high accompaniment support* is characterized by an increased use of handrails. The resident is supported over long distances Continued positive for independent mobility in moderate to severe disease is the automatic return from two sides. The high building density (planting) and the Different levels lead to a low level of insight. This allows the Visitors cannot see every part of the outdoor space completely. Due to the In the endless loop of the figure eight, the decision moments for branches are kept to a minimum. In this garden, residents can easily enjoy a relatively complete a long journey.

Result: Decision level: 1-2, Insight: 2, Building density: 4 and automatic Feedback: present (double, from 2 sides); *on a scale of 1-5 (1=low; 5=high)*

4.3.6 Type 6 – Sanatorium-atmospheric spatial density for a positive mood

a) Type 6 – Design data



Principle:	sensory theme zones and artistic elements
General orientation level:	Accompaniment conceptually provided
shaping:	curves
Room layout:	stylized specification
Local character:	urban character
Population of the town:	16,000
Year of construction of the system:	2005
area size:	1000 m²
Alignment:	adjacent to the back of the dormitory
Resident places:	122, of which 73 places are for people with dementia
Concept:	landscape architect A. Nix
dormitory:	Weilerswist Senior Center
Carrier:	AWO Bezirksverband Mittelrhein eV
Location:	Weilerswist

b) Type 6 – Description

Figure 41. AWO retirement home, Weilerswist.
Source: Teimann

In 2005, the Weilerswist Senior Center built an outdoor facility especially for residents with Dementia and seniors with advanced age impairment. Planning with the
The name *Garden of the Senses* was given by the landscape architect Alexander Nix. Conception includes the idea of the *hiking trail* of SUNBECK with the title “Infinity walk. Preparing your mind to learn”.173 This makes the basic planning of 1000 m² Area spatial density is necessary. The density is determined by the inhabitants who have an intensive
The formation of zones according to
sensory stimulation (sight, touch, taste and hearing) is the characteristic Feature of the facility. In addition, artistic details are used: spherical Frames in the tactile railing, which has different metal surfaces; an optical Magnifying device that brings floor details into the resident's limited field of vision; or even a monolithic sculptural object that represents the centre of the complex. The The loops that have to be walked repeatedly each cover a distance of 30 - 40 m with a path width of up to 2 m. Most of the circular paths are equipped with handrails. A sun-protecting pergola roundabout leads the resident to a
lakeside terrace, which provides an atmospheric setting for the daily Events offered by the senior citizens' center for its residents.

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[173] See URL: http://www.infinitywalk.org/Education/IWPreparingYour%20MindtoLearn3rdEdChap1.pdf (20.01.14, 16:30h).

c) Type 6 – Recording of gaze directions, mobility progression and cognitive demands

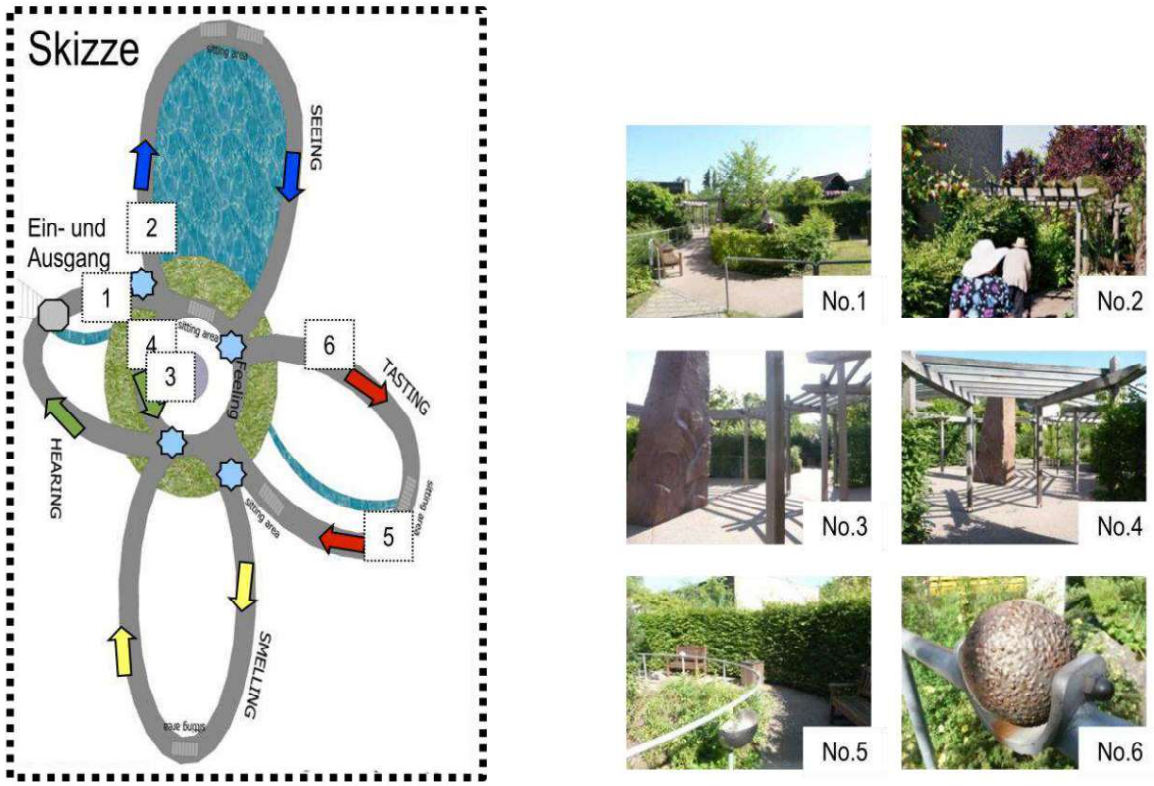


Figure 42. Gaze directions – type 6.
Source: Teimann

Figure 43. Mobility trajectories – Type 6.
Source: Teimann

The conception type 6 *Sanatorium-atmospheric spatial density for a positive mood* occupies a special position here. The stylized planning specification in the sense of a *Hiking trail with learning program* is based on form-giving, concentrically circular Endless paths. The focus is on the atmospheric plant density.
As a result, the building density is high and the visibility throughout the entire complex is low. Conceptually, a positive mood among the residents is
These patients may be treated in the advanced stages of their disease with a Accompanying assistance will experience a divided theme garden in artistic design.

Result: Decision level: 5, Insight: 1, Building density: 5 and automatic Feedback: none; *on a scale of 1-5 (1=low; 5=high).*

4.4 Comparison of typologies in application to the severity of dementia

Previous evaluation categories for dementia gardens in inpatient facilities were
Use of endless paths, theme gardens and the adaptation of space to the movement pattern of the
those affected.

The present analysis considered characteristics of open space typologies that are
increased the orientation and perception ability of dementia patients in space
For 6 open space typologies that have been used so far, it was recorded whether they have a
automatic return and whether a high building density is required in the respective open spaces
or low visibility or – conversely – low building density or high visibility
These evaluation parameters were selected to provide the orientation and
decision level that can be classified with the typology of the demented walker
The result was a ranking of the typologies with a respective
Added value for the individual phases of dementia.

The results of this evaluation are presented as an overview in Figure 44 on the next page
to view.

Type 1 would be a linear path system - without automatic return and with
high decision-making level - in the pre-dementia phase as well as in mild dementia
In contrast, type 4 with automatic return and low
Decision level in the case of moderate dementia – with additional need for open
terrain insight and increased individual support.

With the use of different typologies, the tendency is emerging among planners to
The further the dementia progression in the target group, the greater the building density should be increased.
From this it can be concluded that there is a general increase in
Building density has proven itself when it came to, for example, less room for
Decision-making and goal-setting processes. This is due to the often
The view expressed in the planning area is that a strongly embedded vegetation and
manageable small spaces give the dementia patient a feeling of security and thus
contributes to improving the mental mood. This is a widely used
Planning criterion whose effect size has not yet been determined by qualitative or quantitative
Investigations could be proven and as a target parameter to be investigated not in the
is addressed in this work.

Addition: The special concept, type 6 (see Figure 45), has a very high construction and Vegetation density across the entire open space and the development system is very This means that the performance requirements for the inspection are high Orientation and decision-making level. Independent mobility is hardly possible here. A design concept for people with advanced dementia should include accompanying assistance and group supervision are also required.

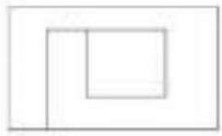
Typologien	Merkmale der Anlage Skala 1-5 (1=niedrig; 5=hoch)	Orientierungsniveau	Entscheidungsniveau	Mehrwert (bei) +++	Primäre Mobilität	Zunahme der Demenz
Typ 1	Keine automat. Rückführung; Baudichte: 1; Einsichtigkeit: 5	hoch	sehr hoch	Präphase bis leichtem Krankheitsverlauf		
Typ 2 	Keine automat. Rückführung; Baudichte: 2; Einsichtigkeit: 4	hoch	hoch	leichter Demenz mit relat. hoher Bewegungstauglichkeit		
Typ 3 	Automat. Rückführung; Baudichte: 2-3; Einsichtigkeit: 2	mittel	mittel-niedrig	individ. Fitnessbedarf mit und ohne Hilfsmittel		
Typ 4 	Automat. Rückführung; Baudichte: 3; Einsichtigkeit: 2	niedrig-mittel	niedrig	Bedarf an offener Einsicht in Begleitung		
Typ 5 	Automat. Rückführung; Baudichte: 4; Einsichtigkeit: 2	niedrig-mittel	niedrig	höherem Schweregrad für eine längere Wegstrecke		
Typ 6 	Sonderkonzept: Kaine automat. Rückführung; Baudichte: 5; Einsichtigkeit:1	hoch; Begleitung vorgesehen	hoch; Begleitung vorgesehen	schwerem Krankheitsverlauf mit Begleitassistenz		

Figure 44. Comparison of previously used typologies in application to the severity of dementia.
Source: Teimann

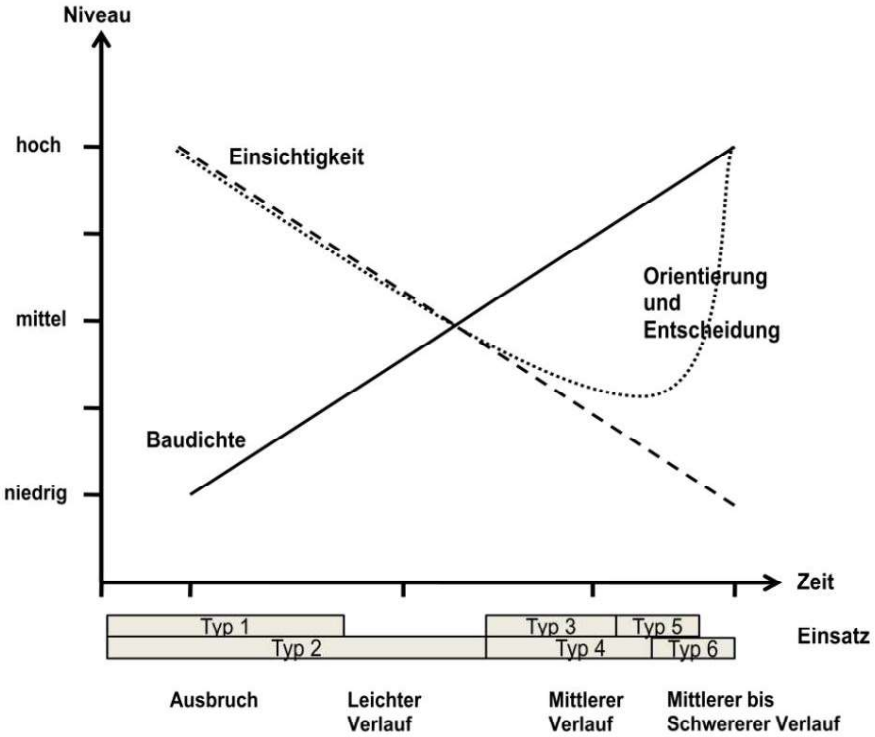


Figure 45. The orientation and decision level of types 1-6 in relation to the severity of dementia.
Source: Teimann

The importance of typology for the construction of a dementia-friendly outdoor facility in Fliednerdorf

The current status analysis of dementia gardens, types 1 – 6, provides criteria for the construction of an open space prototype as well as for the conception of the functional therapeutic open space concept for *The Village - Living in Old Age* by Theodor Fliedner Foundation as the client.

The open space prototype174 (see Chapter 6.1 – Theory and construction plan – a prototype), which served as a model for the planning process, takes up 3 basic principles:

1. The typology of the endless path 175 as a further development of typologies 1–6.

Number 5 is particularly important here. The key here is to maintain and the enhancement of the principle *of automatic regression* of the *Reclining Eight* typology .

[174] © 2010, Teimann, see Chapter 6, *Functional-therapeutic open space concept* See
[175] Figure 73.

2. Use of the criterion *High building or vegetation density*

For the prototype as a dementia course, a path border with person-high vegetation chosen to prevent the walker from breaking off the path. This enables a controlled Orientation is guaranteed.[176]

3. Use in *advanced dementia*

The prototype is primarily intended for use by residents with advanced dementia in a central area of around 230 m².177

For the implementation of the dementia outdoor facility in the *village – living in old age* (see Chapter 6.2) – according to the living and usage concept of the facility – the following 3 principles are used:

1. The typology of the *figure eight,* type 5

For the elongated shape of the building site178, the typology of the *figure eight* and a clear room layout was chosen.

2. Use of the criterion *High Insight*

This aspect was used for the construction of the facility in Fliednerdorf. The The facility management intended to use the site primarily by residents (pre-phase or The planning involved a Access to the site from two opposite sides, with emphasis on visibility. This would bring us close to the application range of types 1-3: *pre-phase to moderate dementia*

3. Use *in mild to moderate dementia*

The design was to cover an area of 1300 m². On the one hand, the focus was on unaccompanied mobility, so that the orientation and decision level for the walk On the other hand, open space objects were built that were The target group of users is *people with mild to moderate dementia .*

[176] See Figure 73.
[177] See Chapter 6, *Functional-therapeutic open space concept*
[178] See Figure 90.

Part B

research study

5 Test site *The Village - Living in Old Age,* Theodor Fliedner Foundation (TFS)

5.1 Architectural pioneering idea and guiding principle

In 1981, the Theodor Fliedner Werk Nordrhein-Westfalen, a large facility
the Diakonie for work with the disabled, elderly care, hospital care and training.
The construction project in Mülheim an der Ruhr, district of Selbeck, included a village with inclusive
Spatial conception that had never been realized before in Germany.

Figure 46. Aerial photograph of the Fliedner village.
Source: TFS (2013)

The pioneering idea behind this project was to explicitly avoid the previously
Hospitalization effect widespread in care buildings and the implicit architectural reference
on the collective defect aspect among the residents. The project was preceded by the urgent
The desire not to leave people in an environment that *manages* and *regulates*
but to create a framework in which residents, staff and relatives
Experienced *normality* . The then managing director of the Fliednerwerke and pastor of the village,
Klaus D. Hildemann179, was the originator of this idea, initiator and committed builder. He initiated the

[179] Klaus D. Hildemann, born in 1942, studied Protestant theology, educational science, philosophy, sociology and psychology; he received his doctorate in 1976. After reunification, he built up the Fliednerwerke in Saxony and Brandenburg. In 1996 he founded the Institute for Applied Theory and Diaconal Sciences in Bonn, which introduced the Master's degree course *in social management* in 2001. In 2011 he left the Theodor Fliedner Foundation as managing director.

necessary preliminary considerations for planning. For example, assessments from Scandinavian villages and discussions with disabled, non-disabled and elderly people. These were primarily asked about how they wanted to live. This was followed by professional Meeting with architects and staff as well as students of the Institute for interdisciplinary and applied diaconal science at the University of Bonn. In 1986, the Village completed with the involvement of 5 architects.

At the beginning, 500 people moved into the village. The distribution was as follows: one third old and elderly people in need of care, one third young families and one third disabled people. The Work Statute180 provides that more disabled/care-dependent people than non-disabled people should live there. In 2013, the now There are already 600 people in the 64,000 m² village area.

From the point of view of mental impairment, it should be noted that around 140 people with diagnosed dementia are cared for in the village. Other care focuses are addiction, Pain and end-of-life care.

The model of the diaconal village community has been developed over the past 230 years from the work of the Rhenish Diaconal Service, which was founded by the founder of the foundation, the Protestant Pastor Theodor Fliedner (1800-1886), who played a key role in shaping the The work of the Theodor Fliedner Foundation grew out of the diaconal faith community caring people from Christian-human tradition in the time of the beginning Industrialization. Based on the model of this village, which is based on the pillars of *normality, Individuality and participation ,* the change of times becomes clear. Because according to today's Understanding, human dignity includes not only physical integrity and health, but also

- the possibility of independent mobility outdoors, an
- individual living situation through personal items,
- taking into account your own wishes in the daily planning and
- integration into a social structure, in this case the village community.

The basic pillars of the suffering picture are defined as follows:

normality

"The employees' ideas of normality must adapt to the residents' ideas. Comfort plays an important role in people's well-being. The residents live in rooms with their own

[180] Internal foundation information of the TFS.

Apartment door, garden door, balcony or winter garden. These are usually single rooms. Almost all rooms are on the ground floor and offer the possibility of moving freely outside. By bringing their own small pieces of furniture and by individual furnishings, people can continue with their previous living situation.

In addition to the private rooms, the common rooms should be co-designed by the residents.

individuality

The support provided by the staff to the residents takes into account the individual needs and wishes of the residents in their daily routine and life. The cornerstones of the support are the anchors of memories from the respective biography. The interests, abilities and skills of the individual residents are the guidelines for the design of the daily care and support process. Relatives and carers are included in this process. Human dignity and personality are a valuable asset and deserve respect and protection beyond death.

participation

The promotion of coexistence in the individual houses, in the facility and in the village as a whole is reflected in the wide range of offers. Life is characterized by human encounters and mutual consideration. The village community and the interaction between older people, young families and people with disabilities allows the residents to participate in social life. This also extends to social activities outside the facility."181

5.2 Foundation

During the industrialization, the Protestant pastor, born in 1800, was primarily concerned with reducing the mortality rate among children, the sick and the poor. 160 years later, the Fliedner works see themselves as obliged to preserve the dignity of the disabled, the elderly and the mentally ill and to guarantee the individual living environment that is desired today, especially in Germany. Theodor Fliedner was born the son of a pastor in the Taunus. He studied theology in Gießen and Göttingen until 1819 and then took up the pastorate in Kaiserswerth on the Rhine.

Figure 47. Theodor Fliedner
Source: Fliedner Cultural Foundation, undated lithograph by Georg Engelbach (1817-1894).

[181] See TFS Facility Mission Statement F 1.1. (2013).

From there, he expanded the diaconal system as his life's work and reformed the poor, Nursing, childcare and prisoner care. His work was inspired by the overwhelming commitment of the bourgeoisie and the church institutions in England. With the founding of the nursing or deaconess institution in Kaiserswerth, Fliedner created at that time the first holistic professional health care.

The pastor participated in the Rhenish-Westphalian Prison Society, which intended to improve the prisoner conditions in West Prussia. In 1852 he opened a converted military barracks in Kaiserswerth an institution for mentally ill women and founded deaconess houses in which male candidates were trained to then to be sent to domestic and foreign emergency regions. Theodor Fliedner died in 1886 in Kaiserswerth after a stay in Egypt.

With the Theodor-Fliedner-Werk he founded, the pastor left behind a free work of Diakonie of the Evangelical Church in the Rhineland. At that time, 425 sisters belonged to this – of which 220 are deaconesses for the sick, 52 are teaching deaconesses and 153 are trainee sisters. Fliedner's legacy in the spirit of the community was groundbreaking for nursing and the diaconal system.182

5.3 Organization type and structure

The Theodor Fliedner Foundation is a nationwide foundation in the field of elderly care, Disability assistance, psychiatry and psychotherapy, addiction therapy as well as training, research and teaching.183 It is a member of the Diakonisches Werk of the Evangelical Church in Germany. The Village *Living in Old Age* is a facility run by Theodor Fliedner Foundation. This is the Diakonisches Werk of the Evangelical Church in the Rhineland The foundation currently maintains 29 facilities in five federal states. Psychiatric and psychosomatic clinics, retirement homes and homes for the disabled institutions. The Theodor Fliedner Foundation employs around 2,000 people throughout Germany. The village with a total area of 64,000 m² is divided into therapeutic residential homes, Employee housing and the elderly care facilities *Stationary living in old age* and *Assisted living* . The village consists of 30 buildings, each with its own architectural style.

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[182] See Landschaftsverband Rheinland, Portal Rheinische Geschichte, keyword “Theodor Fliedner”; URL: http://www.rheinische-geschichte.lvr.de/persoenlichkeiten/F/Seiten/TheodorFliedner.aspx (July 4, 2013, 10:33 a.m.).
[183] See TFS Facility Mission Statement F 1.1. (2013).

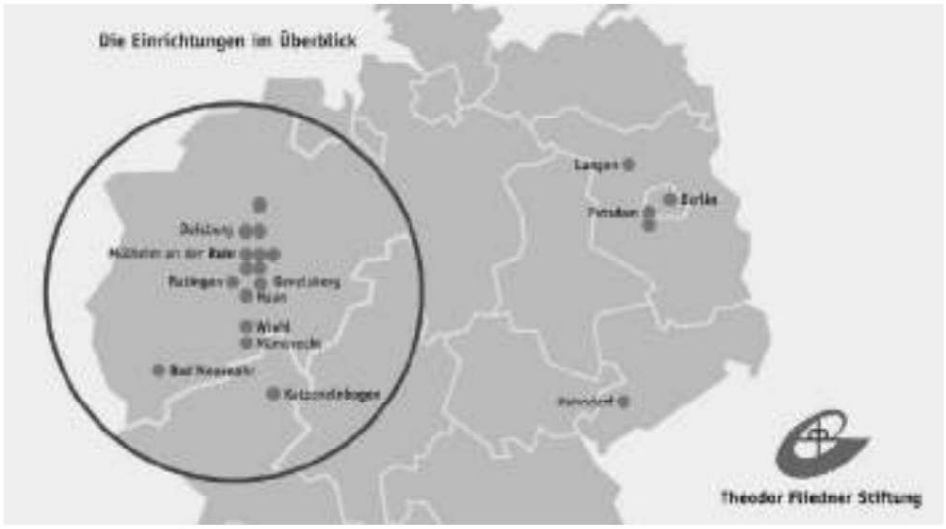


Figure 48. Distribution of the Theodor Fliedner Foundation's facilities throughout Germany. Source: TFS (2013)

The special feature of the village *Living in Old Age* is the focus on care and support
Dementia with specialist medical care. In this model village, up to 210 people are
110 nursing staff; 57 of them are geriatric nurses. In 2011, the facility was awarded a nursing grade of 1.1.184

5.4 Architecture: 6 Designs – 6 Village Areas

Today this project would be called a project of inclusive spatial design,
which also has a socio-political dimension. With the aim of implementing the guiding principle
To transfer *normality, individuality and participation* into structural form, the
At that time, the term inclusion was very similar to today's concept. The leading motto should have been
"We are not building a residential area stigma for you – we are building a beautiful life for you."
An appreciation for the residents is implicitly expressed. This credo
The client wanted to use a variety of architectural styles.

Figure 49. Miniature replica of the Palatinate Church in Aachen (left) and Figure 50. Beguine farm (right) after a design by the architect Krier.
Source: Urbanietz (1993)

[184] See TFS performance description F 1.4. (2013).

The aim is not to integrate previously excluded groups, but to
Acceptance and appreciation of the individual, each of which is different from others
The aim is to identify precisely these individual, self-contained
To involve people in the functional everyday, professional and social processes. In
In “The challenge of support. Perspectives on the way to inclusion”, Krög185 puts it even further:

> "Inclusion means assuming that all people are different and that everyone can help shape and have a say. It should not be about adapting certain groups to society."

In terms of planning, this means that housing concepts with individual supply systems
In this context, it should be mentioned that supply models and
Internal building concepts will not be evaluated in this study. Rather, the
offered urban open spaces under the aspects of the village first impression, the
Unique selling point and dementia-friendliness in the open space.

Regarding the architectural implementation, it was important for the management of Theodor Fliedner
Foundation a basic condition that the commissioned architects do not rely on the usual
nursing home construction. It was hoped that this would provide an innovative approach
to the new challenge without orientation towards existing reference projects.
The winner of the competition was the architect Feddersen. He had the idea of designing the 5 other village districts
to have other architects build it. Until the end of the project, he was in charge of the overall
The following designs were created:

ÿ Monastery beguinage (architect Krier),
ÿ Terraced houses (architect Kulka),
ÿ Multi-part building complex (architect Feddersen, von Herder),
ÿ L-shaped building with open glass bay window (architect from Lom),
ÿ Building with wave-shaped wooden roof (architect Baller) and
ÿ reconstructed fully clinkered old village part (architect Feddersen & Partner)

[185] See URL: http://de.wikipedia.org/wiki/Inklusion_%28P%C3%A4dagogik%29 (05.01 2014, 12:12h).

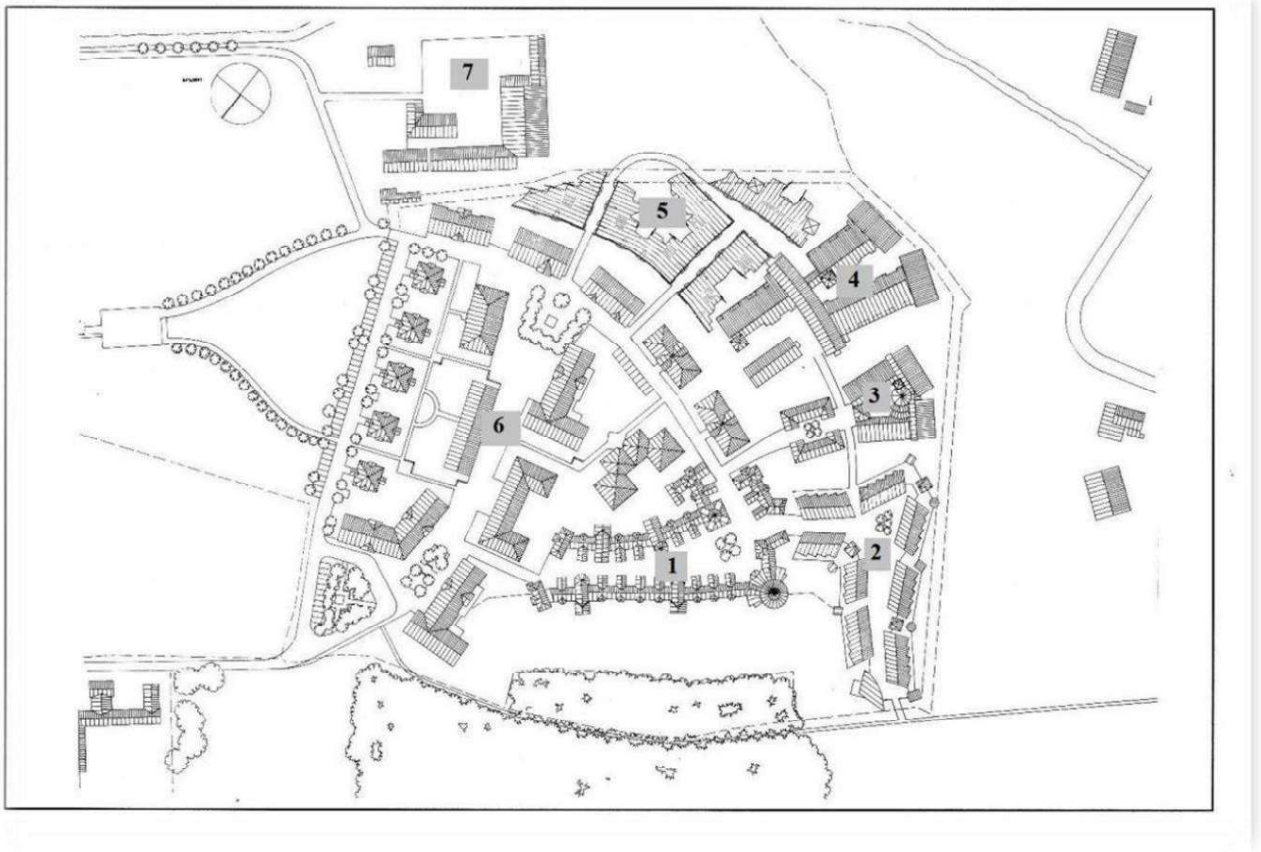


Figure 51. Village parts of the Theodor Fliedner Foundation, Mülheim an der Ruhr. 1 Krier, 2 Kulka, 3 Feddersen/v. Herder, 4 v. Lom, 5 Baller, 6 Old village part: Feddersen/v. Herder and Riege, 7 Farm. Source: Reinsch (1993)

A few years after completion in 1986, REDECKE dealt with the topic in the trade magazine "Bauwelt" and DASSLER in the "AIT. Journal for Architecture, Interior Design and Technical development" with the architectural results. REDECKE'S critical His overall attitude towards the project is particularly evident in the fact that he Consideration primarily on the construction difficulties and the personal and professional For example, he writes about Krier's contribution that he was the

> […] "Most colorful and loudest" and offers the "old people a true doll world", yes, he transports them into an "artificial world". [186]

DASSLER took a more moderate look at the issue in his article a year later. interaction of the pioneering construction project. He emphasized that

> "[…] Social scientist Hintze and the people she looks after confirm that one can feel comfortable here […]."187

[186] See Redecke (1993).

An overview of all 6 architects' designs and the 6 village areas is given in Figure 52 *Design distribution over the village area with facade views.* In the following Figure 53 shows the characteristics of the individual designs. In summary will be followed by brief descriptions of the designs with regard to the original Intended use in 1986 and current occupancy practices.

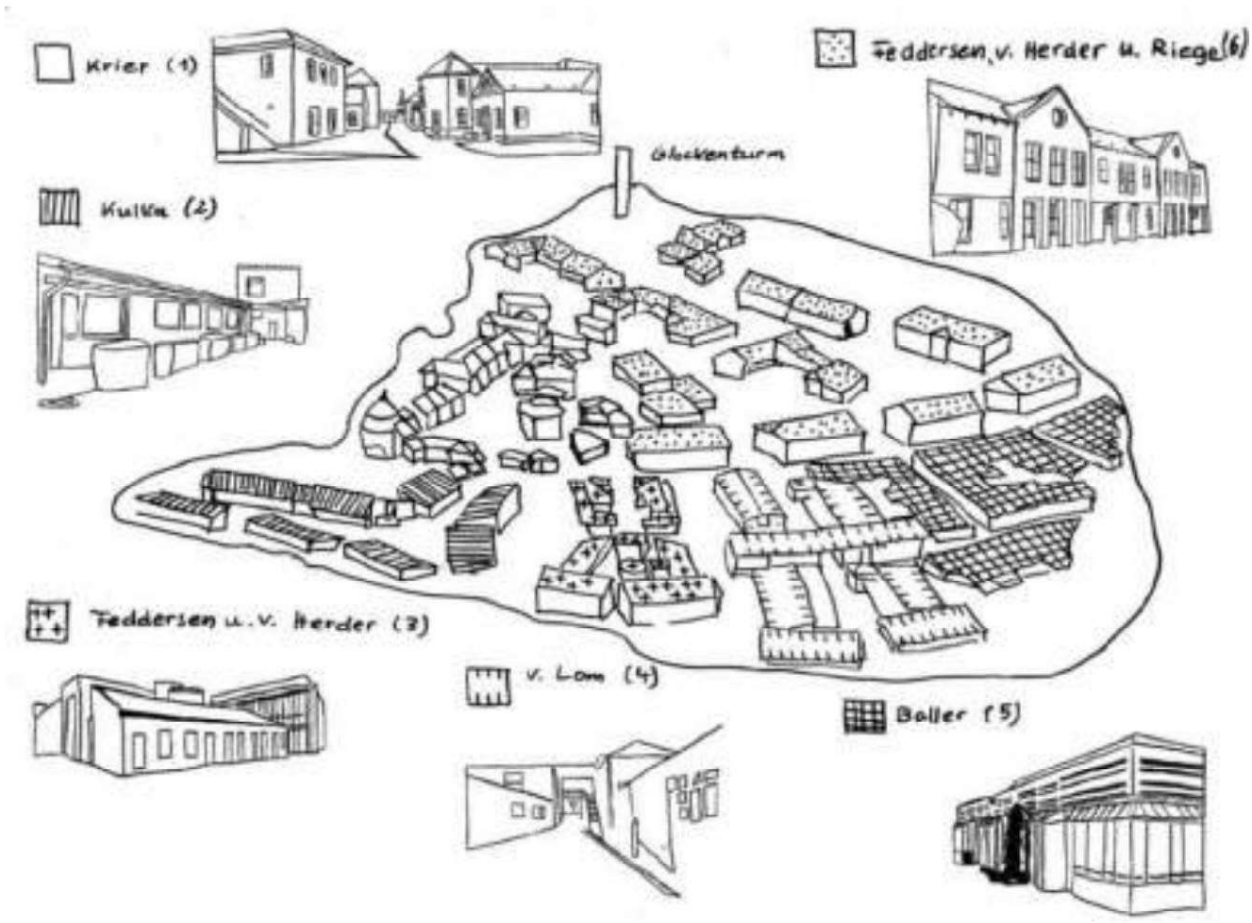


Figure 52. Design distribution over the village site with facade views.
Source: Teimann

[187] See Dassler (1994).

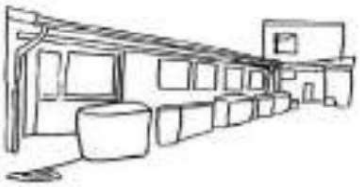
architect	architectural style	street view	characteristics
1 Rob Krier	Monastery- Beguinage		Colorful originality with vis-à-vis character
2 Peter Kulka	terraced houses		Youthful atmosphere for dementia care routine
3 Eckhard Feddersen and Wolfgang von Herder	multi-unit building complex		Tour typology for those in need of intensive care
4 Walter von Lom	L-shaped Building with open glass bay windows		Airy spaciousness with many views
5 Hinrich Baller	Building with wave-shaped curved wooden roof		Striking atmosphere with socially active meeting spaces
6 Eckhard Feddersen, Wolfgang von Herder and Aribert squad	reconstructed fully bricked old village part		Massive clinker buildings for clarity and predictability

Figure 53. Comparison of structural features of the individual designs for the Fliednerdorf.
Source: Teimann

Design 1 – Monastery Beguinage / Architect: Rob Krier

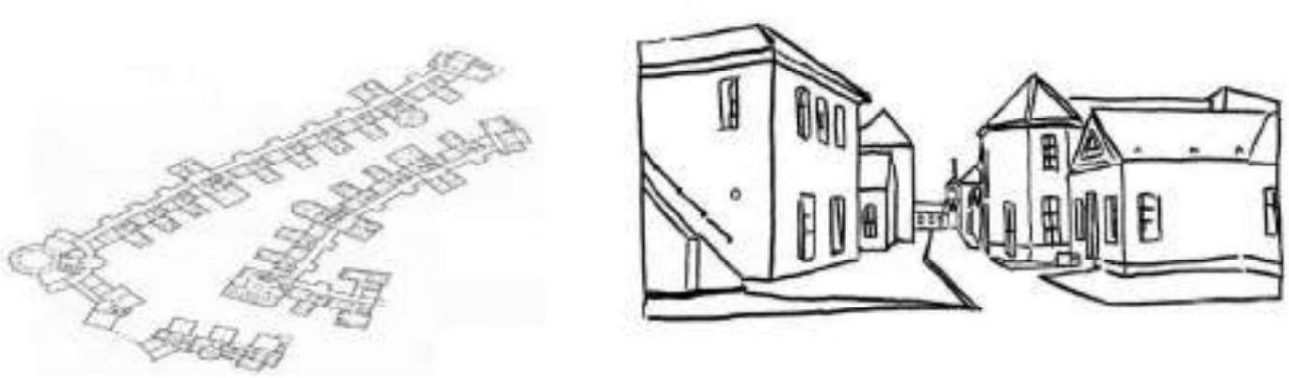


Figure 54. Typology and facade view of design 1.
Source: Krier/ Teimann

Intended use in 1986: Assisted living

Short description:

Krier's solution stands out with a positive, *colorful* originality. The buildings are for
The residents will be primarily on the ground floor and the employees will be on several floors.
the geometrically clear, narrow individual houses that are connected to each other and the
maximum 1.5 meter long front gardens, the vis-à-vis character comes into play immediately
and promotes the neighborhood. The street, built on both sides in the style of beguinages
ends in the miniature replica of the Aachen Palatinate Church. It was originally built as a bathing facility
but is now used for church services, which shows how free and
how creative this architectural approach was even then. However, the expansion of the
wellness area after completion of construction is no longer financially viable for the client.
controversial architectural criticism of this design have already been discussed above.
considered.

Occupancy practice 2013: 85% accommodation for people in need of care and 15%
Assisted living. [188]

[188] Internal foundation information of the TFS.

Design 2 – Terraced houses / Architect: Peter Kulka

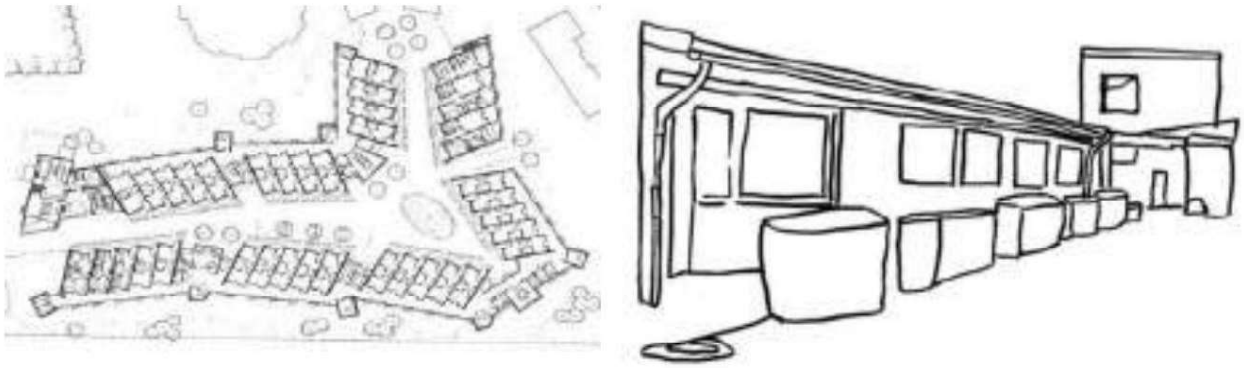


Figure 55. Typology and facade view of design 2.
Source: Kulka/ Teimann

Intended use in 1986: Living spaces with uniform furnishings

Short description:

This building group with Dutch-Scandinavian influence testifies to youthful Ambience. It is intended for the care routine of dementia. Numerous residential Subunits and the mix of private and centrally supplied units allow for a high Flexibility in occupancy. In this way, neighbourly living with People who exhibit challenging behaviour. If necessary, Reassignments can be carried out at short notice. The architectural theoretical consideration In the author's opinion, REDECKES is too deficit-oriented in this case:

> "His [Kulka's, author's note] direction is more oriented towards youth villages with a strict terraced house concept […], determined by the repetition of the same building structures with a few special elements. […] due to cost pressure, the open fireplaces [were] eliminated. All that remains are useless niches."189

DASSLER, on the other hand, also recognizes the flexible handling of the design, because

> "[…] Kulka differentiates between central and private entrances and thus between central and private facilities […]".190

ÿ *elegungspraxis 2013:* Approximately 40% with a focus on dementia/challenging behavior used, approximately 50% occupied by people in need of care and the remaining portion is intended as additional rental apartments.191

189 Redecke (1993), pp. 2324 and 2326.
190 Dassler (1994), p. 24.
191 Internal foundation information of the TFS.

Design 3 – Multi-part building complex / Architects Eckhard Feddersen and Wolfgang von Herder

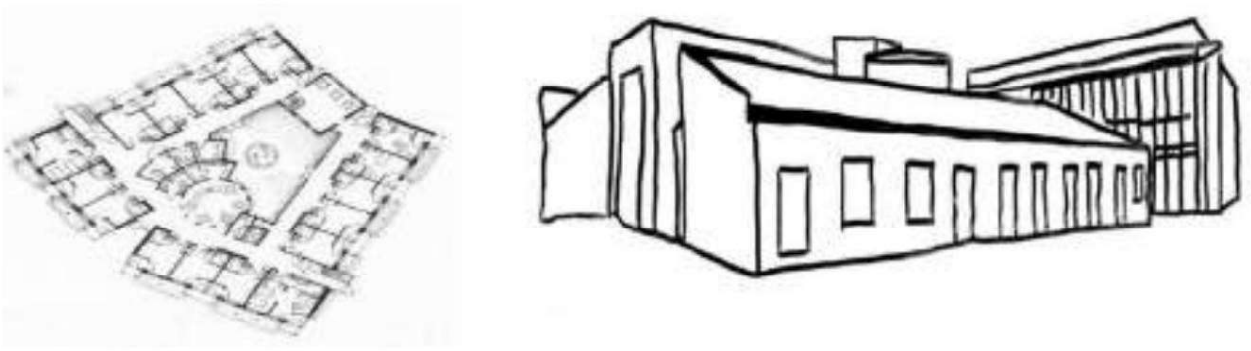


Figure 56. Typology and facade view of design 3.
Source: Feddersen/ Teimann

Intended use in 1986: Accommodation of people in need of care

Short description:

Feddersen's core idea for this design is a tour typology for the care of
All other structures in the outdoor area are designed
adjacent geometric structures.

The living areas are primarily directed towards the interior, an inner courtyard that is
This architectural aspect is often
highlighted to show that the indoor circular path is a relief for the
finding your own room again. REDECKE comments:

> "The walkway has preserved the character of a home, the 'institution'. Accordingly, this complex is particularly well suited for residents who require intensive care and who suffer from disorientation. [...] The staggered arrangement of the buildings results in numerous interlockings and refractions. This makes it possible to 'dissolve' the corridor and create open front areas."192

Occupancy practice 2013: Accommodation of people in need of care with a focus on dementia / challenging behaviour.193

[192] Redecke (1993), p. 2328.
[193] Internal foundation information of the TFS.

Design 4 – L-shaped building with open glass bay window / Architect Walter von Lom

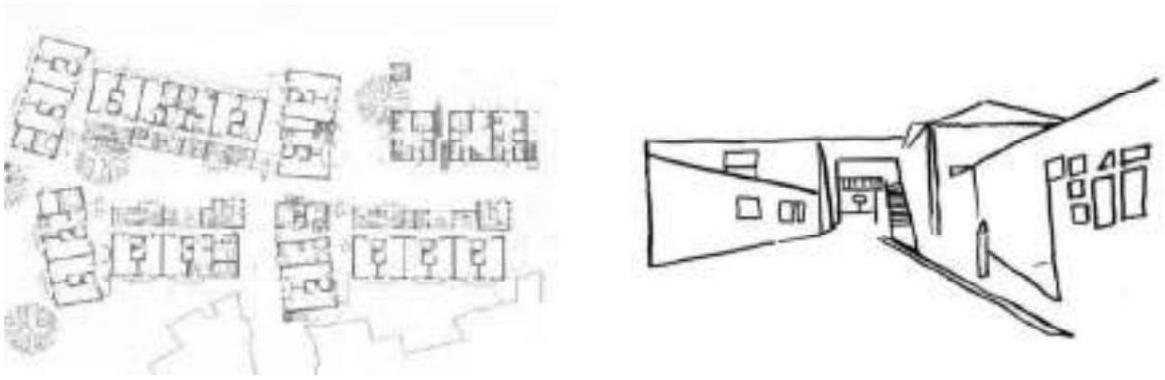


Figure 57. Typology and facade view of design 4.
Source: Lom/ Teimann

Intended use in 1986: Separate living and senior living

Short description:

From the outside, the building is difficult to grasp as a unit. On the inside, however, the following Features have been efficiently implemented: The open layout of 6 - 8 rooms avoids the corridor character that was not desired at the time; the conception of several staggered residential units allows for many views. Each room has a window to the anteroom and At the back there is an entrance area to the garden. The many glass fronts create *an airy spaciousness* .

The architectural criticism of DASSLER and REDECKE is as follows

> "The appearance of Walter von Lom's district is probably the most unspectacular in this ensemble. […] In addition, his buildings offer a wide range of amenities that the residents already appreciate very much."194

> "Walter von Lom's concept has probably been most widely accepted […]."195

Occupancy practice 2013: Exclusive accommodation of persons in need of care196

194 Dassler (1994), pp. 26.
195 Redecke (1993), SS 2328.
196 Internal foundation information of the TFS.

Design 5 – Building with a wave-shaped wooden roof / Architect Hinrich Baller

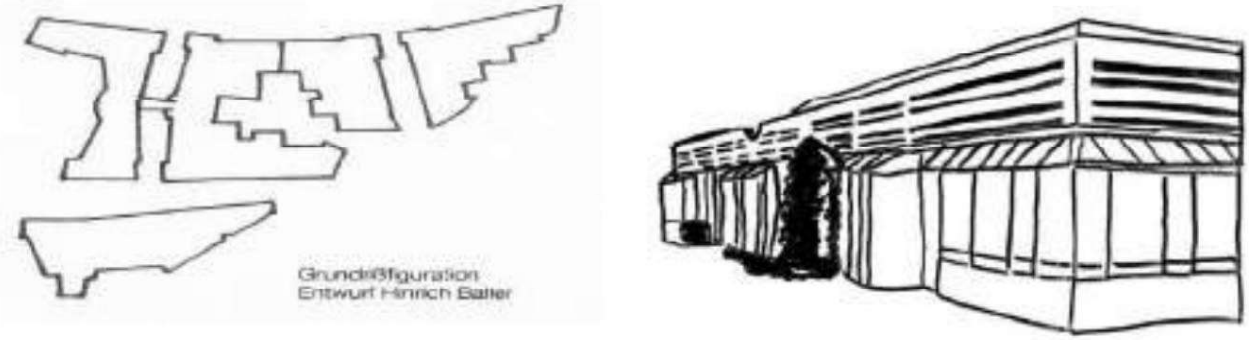


Figure 58. Floor plan and facade view of design 5.
Source: Baller/ Teimann

Intended use in 1986: Only rooms, no separate apartments

Short description:

Baller's design, with its not clearly identifiable geometric shapes, presents itself as

The building is a complex of interlocking and interlocking elements with

Wave roof, wooden porches and integrated glass elements. The detailed design

Carpentry workshops have been brought to the highest level of craftsmanship.

curved wooden roofs, supported by steel beams, create the unique spatial atmosphere

in the large meeting rooms and the adjacent smaller rooms. REDECKE judges

as follows:

> “Baller completely dispensed with the employee housing that was part of the program, which was either integrated or planned in a separate building. He opposed the program because housing did not fit into his concept.”197

DASSLER quotes the architect’s words:

> "His houses are not intended to be 'final products', but rather to accompany life, appearing new again and again, through different perspectives and new possibilities for use [...]. To realize such a project, in a time in which every technical regulation is geared towards isolation, individualization, marketing, supply, control and power, places high demands on everyone involved in the construction."198

Occupancy practice 2013: Exclusive accommodation of persons in need of care199

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197 Redecke (1993), p. 2331.
198 Dassler (1994), p. 27.
199 Internal foundation information of the TFS.

Design 6 – Reconstructed fully clinkered old village part / Architects Eckhard Feddersen, Wolfgang von Herder and Aribert Riege

Figure 59. Facade view of design 6.
Source: Teimann

Intended use 1986: Intended for disabled people, families and employees

Short description:

REDECKE evaluates the construction of the competition winner as follows:

> "The old part of the village, […] in which disabled people, some families and employees live, is still stuck in a good postmodernist idea of 'rural architecture' at the beginning of the eighties. It is far more uniform than the new part and is not relevant for an architecturally critical examination […]."200

The architect's primary design premise was the deliberate creation of clarity,

Tidy and predictable. The old part of the village with its three floors is

repetitive gable extension between eaves roofs. The simple

Columned entrances appear sublime in a simple way. A *Protestant*- looking rural idyll

surrounds the town hall, which, together with the extension, is intended for young disabled people aged 18 and over

accommodates.

Occupancy practice 2013: Accommodation of exclusively disabled young people201

5.5 The Fliednerdorf and its urban development

The village stands out due to its spatial cohesion, away from the Mülheim district

Selbeck and surrounded by forest, pastureland and a designated

Landscape conservation area. When entering the village, the trained observer will notice

that it is not a grown village. Rather, it offers an unusually

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200 Redecke (1993), p. 2331.
201 Internal foundation information of the TFS.

A village of great dimensions and built in a uniquely short construction time. The visitor will directed to two main parking lots and on foot – depending on the location – through the striking Residential complexes designed by Rob Krier in an idiosyncratic combination of form and colour. Or his way to the town hall leads him through the loosely grouped massive clinker buildings of the *old* part of the village of the Feddersen office community. Through such conscious planning changes The visitor experiences a kind of atmospheric tension as he passes through the village. This becomes even clearer the more streets the visitor looks at.

The special use of the place is highlighted, among other things, by the fact that A large traffic-calmed zone has been created around the town hall, which is traffic-calmed road network branches out in all directions. The usual dominance of the car is not found here.

Figure 60. The path network is primarily designed for pedestrians. Source: TFS (2013)

Cars mainly drive there for transport to and from the facility. Elderly and disabled residents can move around barrier-free, just like in a pedestrian zone. Individuals in wheelchairs or People with rollators move independently, residents sit in front of their houses, and larger Groups of disabled people walk through the village accompanied by a guide. The starting points can be: hairdresser, grocery store or bistro.

From today's perspective, it can be said that the village with its unique, characteristic Structure and practiced care models – elderly and disabled – until 2013 in Germany has not been imitated. The type of overall planning of the major project under the leadership of the architect Feddersen with varying individual solutions on exclusively ecclesiastical grounds was considered exceptional, even unique Internally, the foundation states that “from the perspective of today’s

Building regulations would no longer be easily implemented." In the meantime, this
Village can look back on almost 30 years of care and support experience.
In particular, the functional spatial interplay of the care models as well as the
Outpatient and inpatient care and assisted living were tested here in an exemplary manner.
The Theodor Fliedner Foundation regularly organizes village tours
organized to illustrate practical experience in care and elderly management.
The target group is experts in care management and municipal planning.
The village is internationally famous; even visitors from Asia travel to the
Ruhr area. In summary, this project is a
It is an unconventional, innovative project of the 1980s – and at the same time a
architectural experiment between utopia and functionality.

5.6 The Fliednerdorf and its quality in terms of elderly and dementia friendliness

What degree of dementia friendliness applies to the open settlement area of the Fliednerdorf
To answer this question in full, a
A consideration scheme has been developed. It will be explained below.

Before doing so, however, it should be noted that all 5 architects, within the framework of their design,
micro-space have found an answer to the respective uses to be fulfilled. At the beginning
During the construction phase, in early 1988, the main premise of the client TFS was not to create residential areas
for dementia patients, but rather a functionally and aesthetically sophisticated
Alternative to the usual *modular formats* of elderly and disabled accommodation with
In the early 1980s, the
Home Building Ordinance and Barrier-Free Construction are only partially taken into account that concepts
for the disabled and the elderly were to be included. The structural work on the
Barrier-free home construction deepened in the early 1990s with the publication of the first
book on this topic: "Barrier-free construction for the disabled and elderly"202. The term
Dementia-friendly architecture only became established in the early 2000s with the increased demand
for new forms of housing and accommodation for the last phase of life of the elderly
section of the population. funding programs support as a result infrastructural
Since then, gaps in care have been filled by modernising *closed dementia areas* and
Restructuring of neighbourhoods. The general social challenge of
Dementia and the shifting of the *care burden* away from the family was evident in the
The planning of the village 30 years ago did not take place in this form. The infrastructure-led

[202] See Stemshorn (1994).

urban walkability concept, according to which people can move freely and
Being able to move around socially was not yet part of the program at that time. If the
Dementia resistance of the Fliednerdorf as an extended quarter of 64,000 m² and as a micro-city
If the variant is to be assessed from today's perspective, new criteria must therefore be established that
Classification of mobility and orientation quality. As evaluation basis
various aspects were included:

(1) from the general orientation group of LYNCH203: readable path system and
border lines,

(2) from the orientation forms of WEISMAN204 : findable abbreviations,
Visual relationships and architectural features as well as

(3) based on the potential design and planning solutions of MITCHELL et al.205: central places or locations that can be reached within 5 minutes.

These aspects are addressed in the gradual overview *Spatial Elderly and Dementia Friendliness*
(Figure 61) 3 criteria were assigned, namely the criterion *of space and order,* the
Criterion *Visible and Walkable Space* and the Criterion *Spatial Orientation Aids.*
These and other parameters to be considered are divided into 3 levels (Level 0, Level I
and Level II). The measures relating to the first two criteria are fixed
Spatial planning elements that can only be implemented with great difficulty after the construction or conversion of the district
can be changed without any effort, whereas the measures in the sense of the criterion
Spatial orientation aids can be used more flexibly. It should also be mentioned here that
detailed and further recommendations for action by MITCHELL et al. in "Making the
outside-world dementia friendly. Design issues and considerations".
include short streets that are adapted to the settlement structure and not
branch off evenly at a 90-degree angle. This and the following examples
The recommendations listed above cannot be taken into account in this first district classification.
Consideration must be given to the following: There must be views every 6 to 30 metres along the road;
all buildings should have clearly visible and identifiable entrances to the street;
Visual hierarchy between main routes and narrower side streets should be present and the overall slope
should not exceed 5%.206 In the case of structural
These aspects should be taken into account in the course of improvements or in the context of an expansion of the Fliedner site.
However, they must also be taken into account.

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[203] See Lynch (1965).
[204] See Weisman (1987).
[205] See Mitchell et al. (2003).
[206] See Mitchell et al. (2003).

short list

“Spatial Elderly and Dementia Friendliness” in Care Building Complexes and Neighborhoods

A gradual overview of the following criteria is shown on the next page in Figure 61 detailed. The textual evaluation of the Fliedner village based on this criteria scale can be viewed on the pages listed.

1. CRITERION: SPACE and ORDER

1.1 Development, p. 105

1.2 Logical Space Syntax, p. 105

1.3 Readable path system, p. 107

1.4 Accessible anchorages, p. 108

1.5 Abbreviations that can be found, p. 110

2nd CRITERION: VISIBLE and ACCESSIBLE SPACE

2.1 Walkable ranges, p. 110

2.2 Sightlines, p. 110

2.3 Visual relationships, p. 110

3. CRITERION: SPATIAL ORIENTATION AIDS

3.1 High-contrast background, p. 112

3.2 Borderlines, p. 113

3.3 Accessibility according to BGG, p. 113

3.4 High-contrast signage, p. 113

3.5 Continuous house numbers according to facade fronts, p. 113

3.6 Control systems, p. 113

3.7 Architectural – artificial or spatial concrete. Features, lighting; p. 113

Fixe

spatial planning

Flexible

Measures

GRADUAL OVERVIEW “SPACIAL AGE AND DEMENTIA FRIENDLINESS”			
DISTRICT SIZE:		STRUCTURE CHARACTER:	
CRITERION	LEVEL 0	LEVEL I	LEVEL II
1.SPACE AND ORDER 1.1			
Development (paths, squares, outdoor spaces)	dense development	dense to loose development	development with designated open spaces
1.2 Logical space syntax	accessible to non-Dementia only with cards	partly becomes clear when walking; questions about the direction are necessary	opens up, route for route, with the inspection
1.3 Readable path system*	linear to linear-complex	designed as a circular route	endless or with branching repatriation
1.4 Accessible anchorages	At least one anchor point can be reached with a rollator and breaks after 20 minutes	At least one anchor point can be reached with a rollator after 10 minutes	At least one anchorage can be reached with a walker after 5-7 minutes***
1.5 Findable abbreviations** only findable by guidance		discoverable by local demand	independently discoverable after repeated visits
2. VISIBLE AND ACCESSIBLE SPACE			
2.1. Walkable ranges max. range around building complex		max. range to the next anchorage	max. range to the end of the district or area
2.2 Sight lines	from one anchorage to the next no line of sight available	In half of the cases there is a line of sight between one anchorage and the next	There is always a line of sight between anchorages
2.3 Visual relationships (Building can be achieved by varying room depths and area overviews much insight and thus a high degree of visual relationships) **	Development leaves little Visual relationships to	Development leaves moderate Visual relationships to	Development is increasing Visual relationships to
3. SPATIAL ORIENTATION AIDS			
3.1 High-contrast background	consistent color scheme	slightly contrasting like black/red or black/grey	more contrasting such as green/ white, green/light brown, green-white or complementary color combinations
3.2 Borderlines*	no clear colour demarcation of the path from the remaining areas, e.g. darker plants and dark green spacing green next to them	clear path demarcation through concise path border	clear path demarcation through colored border lines, architectural path edging or striking planting

3.3 Accessibility according to BGG (Disability Equality Act, Section 8 in force, 2002)	never applies	applies in some cases	applies almost or in all cases
3.4 High-contrast signage	unavailable	barely present	present throughout
3.5 Continuous house numbers according to facade fronts	was not an aspect of the development	was in most areas considered	available
3.6. Guidance systems	unavailable	in some functional areas	comprehensive guidance system
3.7. Architectural, artistic or spatial features**; lighting systems	unavailable	present sporadically	used across the board

*Figure 61. Gradual overview of "Spatial friendliness for the elderly and dementia" in neighborhoods. Notes: * Aspects of Lynch (1965), ** Aspects of Weisman (1987) and ** Aspect of Mitchell et al. (2003)*
Source: Teimann.

5.6.1 Space and Order

development (see Figure 61 under 1.1)

An urban structure that is too dense or disorganized does not, in principle, support the Orientation for people with dementia or impaired perception. Long distances of Visible and manageable zones and designated free spaces convey security (see chapter 5.2). The calm, consistent and predictable routing and the Clarity in the division between path system and open spaces is always considered beneficial In the case of the Fliednerdorf, development with designated open spaces applies, While a uniform village structure with paths, squares and outdoor spaces cannot be clearly can be recognized.

Logical space syntax (see Figure 61 under 1.2)

A logical spatial syntax is derived from the structural village structure and the The ability to distinguish between village areas. In this case, the latter arose from the different design types (see Chapter 6.4.1). Basically, it can be said that that the village areas as spatial concepts are limited exclusively to the individual closed Concepts of the respective architects. They have no explicit reference to the neighborhood or public space. It almost seems as if the Types of furnishings each for themselves and – in terms of orientation – without context to each other The structural character of the village only becomes apparent through the development system. When tracing the path system on the map, a rounded downward (south)

two-sided triangle is visible. There are 3 anchorages and 3 main directional axes
The density of the buildings increases towards the south. The village is completed
of 2 main roads, which form diagonal triangles in the west and east, dividing the village
To the south, the buildings were built on an open area without rear
The distribution of the village areas is very
In the case of the Fliednerdorf, the term *area* does not mean a purely functional area
with regard to different work and life processes. Rather, the term
to be equated with a village part or an architect's design. The one by Feddersen and
The old part of the village , built by the partners, covers the largest area of the site in the north. This
Area is exclusively for the accommodation of disabled people. The Beguine Farm of Krier
was implemented as a single street. The squat village base on the southern village slope
consists from bottom left to bottom right of the terraced houses of Kulka, the
Building complex by Feddersen and Von Herder, the L-shaped buildings by Von Lom and the
Buildings with corrugated roofs from Baller. When it comes to area distribution, no
Recognize the structural principle.

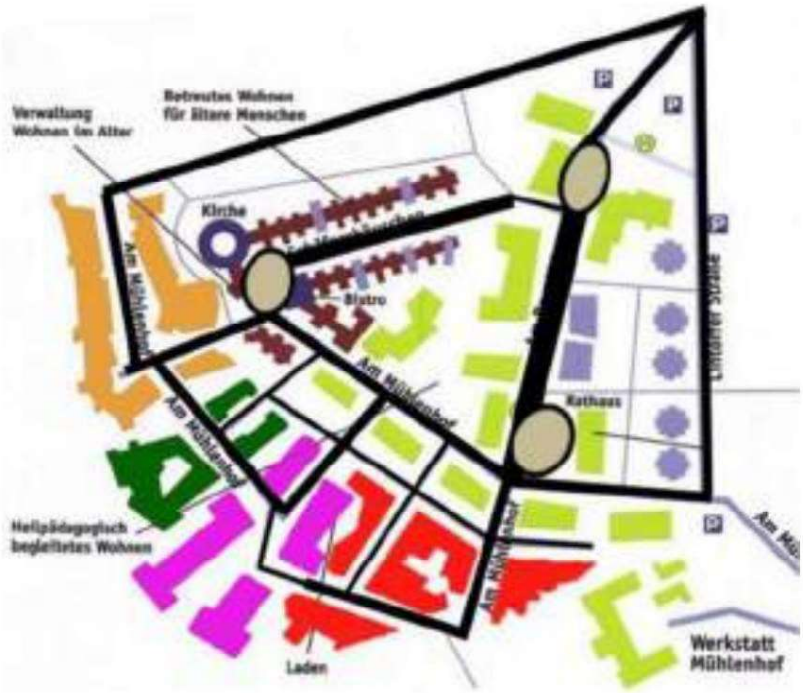

Figure 62. The village "Living in old age": village structure and grey = 3-way system.

Main squares of the village, violet = Arch. Krier, beige = Arch. Kulka, dark green = Arch. Feddersen/v. Herder, Pink = Arch. Lom, Red = Arch. baller and Light green/blue = Feddersen and Partner.

Source: Teimann, modified from a map template from TFS

The distinction based on different architectural concepts is very
The Beguine farm of Krier is particularly noteworthy as a street.
This is located with the entrance to the parking lot at the bell tower on the right edge of the village. Convincing
is the direct location of the single-storey houses on the paths that define the area as an area of
The colour scheme and geometrical
Arrangement of the building structures towards the outside, this assembly is the most striking
describe.

> “A Beguinage (ndl: *begijnhof,* fr.: *A beguinage* is the typical residential complex of the Beguines, which is found mainly in Belgian Flanders and in the Netherlands . A beguinage is located in a city and usually consists of an architectural ensemble grouped around an inner courtyard, consisting of small residential houses of the Beguines, a chapel, outbuildings and often a larger house for the Beguine mistress and with a meeting room. From the 12th century in the Netherlands and the 13th century in Germany, France, northern Italy and Switzerland, members of a community of Christian devotion without monastic vows were referred to as Beguines and Beghards."207

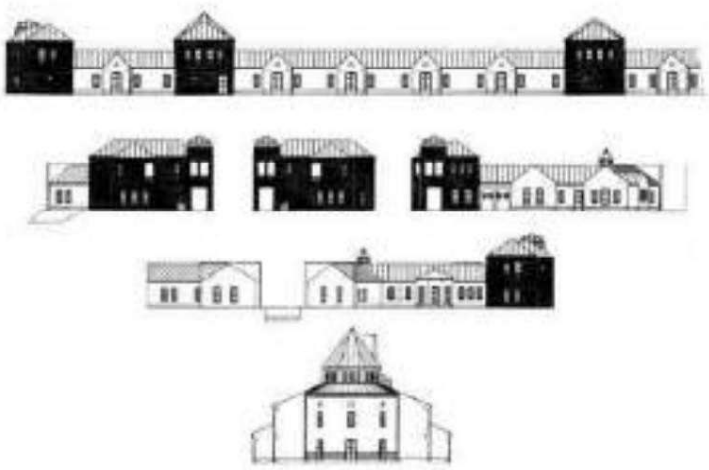

Figure 63. Facade views of the Beguinage of Krier in the village “Wohnen im Alter” (TFS), Mülheim adR.
Source: Krier (1994)

Figure 64. Photo of the Beguine farm of Krier in the village “Wohnen im Alter” (TFS), Mülheim adR.

Source: Krier (1994)

The fact that the Beguinage is strikingly different from the other village areas, has the advantage that residents can say with greater certainty at any time whether they are in their accommodation location or not. In relation to the logical Overall, the spatial syntax of the village is at level I.

Readable path system (see Figure 61 under 1.3)

A purposeful or continuous movement of mild to moderate Dementia without external help is today an achievable goal of the area orientation of Outdoor areas. A closer look at the respective locations of the 6 village areas gives you the impression that the districts were allocated to the architects' orders in terms of area. The designation of the path system seems to have been treated as a secondary priority by the planners.

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[207] See URL: https://de.wikipedia.org/wiki/Begine (4.7.2013, 14:31h).

Nevertheless, the route of the main paths could be described as a kind of circular route, which has strong involves a change of direction.

The path system is very diverse. There is a lot of variation in the path widths and
While in the upper part of the village (Krier and Feddersen and Partner) wide to
very wide paths and 2 squares predominate, the path system narrows in the southern part
(Baller, von Lom, Feddersen and von Herder; see Figure 65). In addition, the
Alignment of the house entrances in relation to the path system. This means that in the case of a
A constant change of orientation is necessary when walking through the village.

Especially in the lower part of the village, the paths were designed purely pragmatically.
This means that an attempt was made to achieve the lowest possible road development – and accordingly little
Building materials – to connect as many house entrances as possible.

According to personal statements of the village employees, it has been proven that precisely at those points
In the village, orientation confusions occur among the residents, where high building density and
narrow path. In addition, it is not only in isolated cases that
Insecurities in the movement sequences, but also to the restriction of
self-confidence when spending time outdoors.

Due to the still recognizable circular route in the path system, the average
Readability in this case can be assigned to level I.

Accessible anchorages (see Figure 61 under 1.4)
There is a geographical village centre. However, it is not a free,
spacious square that could be accessed from several directions. The center of the
The village structure *(Figure 65)* was formed in the west with the Beguine buildings and in the remaining area
with the clinker buildings of the *old* part of the village. Instead of a central square, 3
Large squares were created, which served as anchorages via a main path network in the shape of a triangle with
different path widths are connected to each other. There are

(1) the Bell Tower Square,
(2) the church square and
(3) the town hall square.

The fact that these are 3 prominent places in the village can be seen from the map
(see Figure 65). Location explanations by means of signs on site are missing. The

In this case, connections between the squares are merely directional axes, not Sight lines (see Figures 66 to 68). The walker must proceed carefully here, as he has no way of estimating the distance to the next anchorage.
the accessibility of the anchorages, it seems that at least one anchorage of can be reached from any starting point in the village with a walker in 10 minutes. Therefore, this aspect can be assigned to level I.

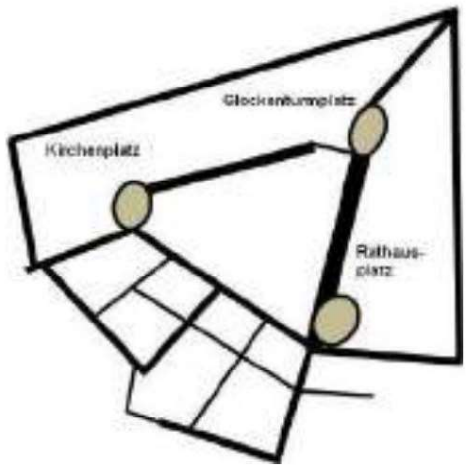

Figure 65. Anchorages in the Fliednerdorf: Glockenturmplatz, Kirchenplatz and Rathausplatz. Source: Teimann

Glockenturmplatz

Figure 66. Axis: Glockenturmplatz towards Kirchenplatz. Source: Teimann

Rathausplatz

Figure 67. Axis: Town Hall Square towards Glockenturmplatz. Source: Teimann

church square

Figure 68. Axis: Church Square towards Town Hall Square. Source: Teimann

Findable abbreviations (see Figure 61 under 1.5)

This last aspect, which falls under the criterion *of space and order ,* refers to the ability
the village visitor to independently identify shortcuts within the village development
Finding destinations and shortcuts within the framework of the
The path system is – even for a non-demented person – only accessible by asking
possible on site. This is why it is classified as Level I.

Emotional connections when walking the path, which also appear in Lynch's spatial observation
play an important role, are helpful for orientation. This is also shown by the individual case
a resident with dementia who described her search for a location as follows: "Through the back, I
know it well, my sister lives in that house!"208

5.6.2 Assessment of the criterion: Visible and accessible space

Walkable ranges (see Figure 61 under 2.1)
It has been shown in the Fliednerdorf that the walkable ranges for medium-difficulty
Dementia patients with an independent ability to move around the space around the individual
care building complex up to the nearest part of the village.

Regular attendance at church services takes place accompanied and in groups.
A superior architectural concept as a contribution to lively interaction in the vital
The village image is not recognizable. In the early 1980s, a specific
Open space planning for the Fliednerdorf is not yet a priority. Nevertheless, a range
with aids to the next anchorage. Consequently, the classification in the
Stage I was carried out.

sight lines (see Figure 61 under 2.2)
There are no lines of sight between the anchorages (see anchorages above).
For this reason, it is assigned to level 0.

visual relationships (see Figure 61 under 2.3)
The type of development allows for varying room depths and area overviews in part
much insight and thereby creates a high degree of eye contact. On average
However, the building structure allows only moderate views. It should be remembered that old
and dementia suffer from diminishing eyesight. Visual relationships that are
Developments should therefore be deliberately created between wide-opening

[208] Personal communication from a village resident on 27.9.2014

Squares and clearly defined paths alternate with nearby window fronts and facade niches.
The latter can also be more than 3 meters away from the mobile passerby.

Cross-area visual relationships can be supported by straight paths
become.

As a misguided example, the road layout in front of the wave-roof building Ballers
(Figure 69 and image number 6 in Figure 70). The visual relationship from the
Alley to the town hall square is only narrowly missed and could have been
Planning correction can certainly be achieved. The reference point remains the
The grey bell tower in the background, which was built later and is far too far away for most old
people, is a problem.

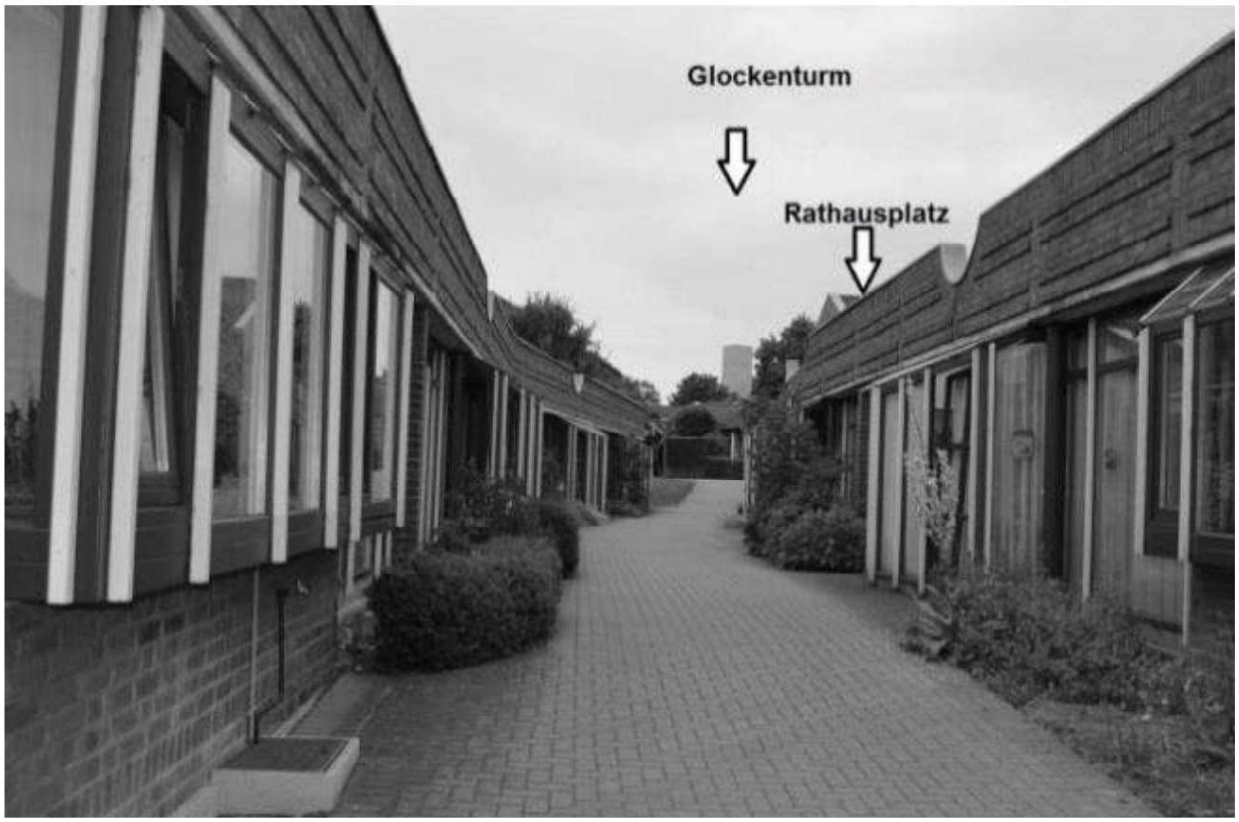

Figure 69. No visual connection with linear path alignment from the wave-roof buildings of Baller to the town hall square.

Source: Teimann

Figure 70. Quality of visual relationships in the Fliedner village at prominent points.
Source: Teimann

5.6.3 Spatial orientation aids

Building materials with different surface structures, colour demarcation of surfaces,
Signage in large print and spatial emphasis through illumination are variable
spatial planning tools. They can also be used after the construction work has been completed
In addition, this makes it possible to share these funds with the
Facility management, staff, residents and relatives to determine and
to implement test phases.

The availability of the 7 aspects (3.1 to 3.7) of the criterion *Spatial orientation aids* of the
gradual overview of the spatial elderly and dementia friendliness in the Fliednerdorf
was examined and given the following ratings:

High-contrast background (see Figure 61 under 3.1)
A background that contains contrast gradations in such a way that the limited
To support the visual perception of seniors, dementia patients and visually impaired people, there are
The building materials for the road and area development are consistently grey
Cobblestones and partly grey-beige water-bound
underground. ÿ Level 0

boundary lines (see Figure 61 under 3.2)

Boundary lines, e.g. as recommended for the delimitation of roadsides, are not
In many cases, the edges of the paths merge into the greenery of the adjacent houses.
ÿ Level 0

Accessibility according to BGG (see Figure 61 under 3.3)

Accessibility is always ensured with the specified dimensions for aids and means of transport.
sufficiently available. ÿ Level II

High-contrast signage (see Figure 61 under 3.4)

Contrasting signage in large print is required to mark paths and
places are not provided. ÿ Level 0

Continuous house numbers according to facade fronts (see Figure 61 under 3.5)

The continuous numbering of the houses on the facades was in most
areas are observed. ÿ Level I

guidance systems (see figure under 3.6)

Guidance systems for structural compensation of the limited field of vision of dementia patients
and visually impaired people are not integrated. ÿ Level 0

Architectural, artistic or space-enhancing features, lighting systems (see in
Figure under 3.7)

Space-emphasizing architectural and artistic elements such as rhythmically placed
Sculptural objects, lighting elements or colour-highlighted house entrances are available
not. ÿ Level 0

5.6.4 Summary of the evaluation

In the gradual overview *of Spatial Elderly and Dementia Friendliness* for Neighbourhoods there are 3
Levels: Level 0 – no dementia friendliness, Level I – moderate dementia friendliness and
Level II – optimal dementia friendliness according to today's standards.

From today's perspective, the maximum level of dementia friendliness with regard to current
Standards have not been optimally achieved. However, it must be taken into account that these
Overall assessment was carried out after a period of 27 years. Building for a

Dementia-friendly neighbourhoods were not yet part of planning practice at that time, due to the not so strong accumulation of the disease in the population statistics.

Criterion 1 *Space and Order* and Criterion 2 *Visible and Walkable Space* correspond on average to the middle level I. Thus, the old and Dementia friendliness of the Fliedner Village rated as satisfactory in these categories become.

Criterion 3 *Spatial orientation aids* is to be classified as suboptimal (level 0). Sub-criteria such as *high-contrast background, boundary lines, high-contrast signage, Guidance systems* and *spatially emphasizing features* are not present in the Fliednerdorf. Only the *The accessibility* aspect has been achieved with the highest level II.

Additional planning elements could optionally be set up to help identify goals. Such flexible Measures can be implemented with the participation of all those involved and in stages as shown in Figure 71.

Figure 71. "Mikado stick ensemble" as a guidance system and spatial orientation tool, implemented in the project "Urban spaces for healthy ageing" (UDE), built in 2012. Source: Teimann

An overview of the qualitative classification of the elderly and dementia friendliness of the Figure 72 shows the Fliedner village, whose gradual criteria gradations are shown in the context of a age-appropriate neighborhood checklist.

Further evaluation content is discussed in detail in this chapter.

GRADUAL OVERVIEW "SPACIAL AGE AND DEMENTIA FRIENDLINESS"

QUARTER SIZE: 230 elderly and demented people STRUCTURE CHARACTER: Triangle

CRITERION	LEVEL 0	LEVEL I	LEVEL II
1.SPACE AND ORDER 1.1			
Development (Paths, squares, outdoor spaces)	dense development	dense until loosened development	development with free designated seats X
1.2 Logical space syntax	opens up for Non-dementia only with cards	partly becomes clear when walking; questions about the direction are necessary X	opens up route for route during the inspection
1.3 Readable path system*	linear to linear-complex	as circular path created X	endless or endless with branching return
1.4 Accessible anchorages	At least 1 anchorage can be reached with a walker and breaks after 20 minutes	At least 1 anchorage is with rollator after minutes 10 reachable X	At least 1 anchorage can be reached with a walker after 5-7 minutes***
1.5 Findable abbreviations**	only discoverable by guide	discoverable through local demand X	independently discoverable after repeated attempts
2. VISIBLE AND ACCESSIBLE SPACE			
2.1. Walkable ranges	max. range around building complex	max. range to next for the anchorage X	max. range to the end of the district or area
2.2 Sight lines	From one anchorage to the next no Line of sight present X	In half of the cases, there are lines of sight between the anchorages	There is always a line of sight available
2.3 Visual relationships (Development can be varied by Room depths and area overviews provide a lot of insight and thus a high degree of visual relationships) **	Development leaves little Visual relationships to	Development leaves moderate visual relationships to X	Development allows reinforced Visual relationships to
3. SPATIAL ORIENTATION AIDS			
3.1 High-contrast background	continuous color scheme X	slightly contrasting like black/ red or black/gray	more contrasting such as green/white, green/light brown, green-white or complementary color combinations
3.2 Borderlines*	No clear path demarcation to remaining areas in terms of colour, e.g. by colour edges or distance green X	clear path demarcation through concise path border	clear path demarcation through colored boundary lines, architectural path edging distinctive or planting
3.3 Accessibility according to BGG (Disability Equality Act, Section 8 in force, 2002)	never applies	applies in some cases to	applies in almost or all cases to X

3.4 High-contrast signage	not available X	barely present	present throughout
3.5 Continuous house numbers according to facade fronts	was not an aspect of the development	was in most areas considered X	available
3.6. Guidance systems	not available X	in some functional areas	comprehensive guidance system
3.7. Architectural, artistic or spatial features**, lighting systems	not available X	present sporadically	used across the board

Figure 72. Gradual overview of "Spatial friendliness for the elderly and dementia" in the Fliednerdorf in 2012.
*Notes: * Aspects of Lynch (1965), ** Aspects of Weisman (1987) and *** Aspect of Mitchell et al. (2003).*

Source: Teimann

6 Functional-therapeutic open space concept

6.1 Theory and construction plan – a prototype

6.1.1 Sensotecture as a compensatory structural planning principle

The Sensotecture is a planning principle hypothetically proposed for this study for the area of *space and health.* It implies that the built environment is connected to the sensorium of the individual so that he or she can meet the everyday demands in direct living environment. This builds on the knowledge from Chapter 3: 3.1 Space and Cognition in dementia, 3.2 Space and perception in dementia, 3.3 Potential of space in Dementia and 3.4 Space as a compensation strategy for dementia. With the help of urban planning Planning and building material modules can be used to design open spaces so that they provide orientation give, encourage and offer maximum rest comfort. The main focus here is on Seniors, people with cerebral dysfunction and people with dementia This approach is intended to help shape the mind and will of these people to promote and maintain the functional joy of mobility as far as possible.

objective	**tools**
ÿ Object perception in the terrain	ÿ Efficiency through the ratio of room size to room density
ÿ Concentration generation	ÿ Creation of a functional-spatial Environment
ÿ Intrinsic target control	ÿ Creating a readable environment

prototype

For the planning process for the construction of a dementia-friendly outdoor facility in the Fliednerdorf I have a specially developed prototype as a 3-D demonstration model for This was developed by me as a standardized dementia course with integrated exercise modules, *equipment for the disabled,* in 2010.[209] In the following Description, this prototype is published for the first time in the illustration. It is referred to by me as *Mobility and Activity Model,* MAM, describes and takes into account existing Free spaces for dementia and Alzheimer's (see Chapter 4).

The main focus of the MAM is: automatic return,

- Endless path,
- Inspection with low decision level and

[209] *© 2010, Teimann.*

• sensorimotor stimulation.

The MAM is a virtual 3D visual model and the basis for the implementation at the test site of the Theodor Fliedner Foundation, in the village *Wohnen im Alter* in Mülheim the Ruhr (see Chapter 6.2).

6.1.2 Mobility and Activity Model (MAM)

The MAM is a newly developed course – within the framework of this dissertation – with a

A total area of 908 m² was created, of which 227 m² are a central area with a radius of 8.5 (see Figure 73). The structure is created by vegetation-limited paths and 5 variants of exercise modules.

In order to promote the object perception of the course walker in the terrain, specially landscape objects have been developed that make the environment more readable and on the other hand lead to a sensorimotor stimulation of the walker (see Figure 73) e.g. 2c) Stone blocks dominance ÿ promoting orientation; 2d) Robinia posts – uniqueness ÿ promotion of body awareness).

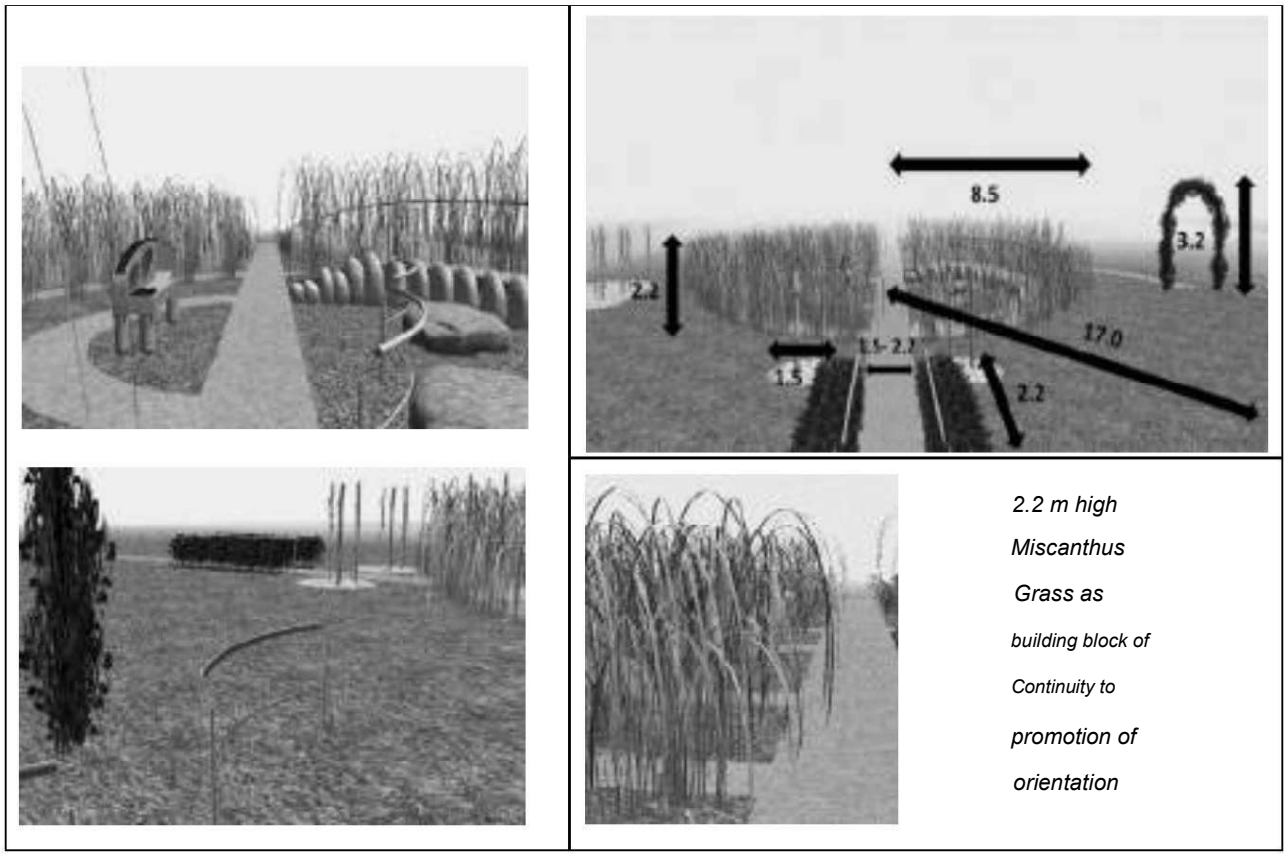

Figure 73. MAM prototype with dimensions. Top left: central area; bottom left: rear view. Source: Teimann

When crossing the site with or without walking aids,

Attention generation – every 3 to 4 minutes of walking time – landscape objects in Viewing height of up to 3.2 m. The intention is to use this to promote activity with different performance levels. The path system is designed as an endless path and also includes an automatic return to the front and rear entrance.
At junctions, the decision level of the walker is kept low by in the central interior area no more than 2 decision options are offered
The 2.2 m high border lines along the paths are made of reeds *(Miscanthus gigantheus)* provide continuous orientation. A break from the path is intended
The ratio of room size to room density is balanced and allows varied insights into the room as well as different viewing relationships different positions.

The MAM focuses equally on mobility and activity. This is is important insofar as, in contrast to the concept of *mobility* (=spatial Position change) the term *activity* additionally includes the *active* component of a movement sequence is illustrated.

The aim of the dementia course is to generate independent movement.

Term: Mobility	*Term: Activity*
"Mobility refers in each case to specific Action or object contexts, the change between places or positions in physical, geographical, social or virtual spaces."[210]	**"Activity** (lat. *activus* 'active', 'effective') is the opposite of passivity and generally refers to an activity."[211]

> "The mere ability to change location or to assume changing positions and postures without changing location is more likely to be considered mobility referred to."[212]

[210] See URL: http://de.wikipedia.org/wiki/Mobilit%C3%A4t (29.11.2013, 11:04h).
[211] See URL: http://de.wikipedia.org/wiki/Aktivit%C3%A4t (11.20 2013, 11:20h).
[212] See URL: http://de.wikipedia.org/wiki/Mobilit%C3%A4t (29.11.2013, 11:04h).

a) Functional spatiality and readability

In order to assess the quality of space for people with dementia, the spatial
The question of whether the city and its
Space has a significant memory potential, the urban planner is concerned
and architect LYNCH. In his opinion, the city is gaining more importance for the individual
subjective meaning, if *5 functional characteristics* as components of functional-spatial
environment. These features are: *areas, paths, boundary lines,*
Focal points and *landmarks.* The landmarks are in turn characterized by the *clarity of the*
Forms of *continuity, dominance, uniqueness* and awareness of movement .
According to LYNCH, a functional and readable environment is a prerequisite for the city and its space to be
remembered and mentally represented.213 It is therefore
It can be assumed that this urban planning normative by LYNCH in the
Planning work for people with cerebral dysfunction is particularly important
can be granted.

Functional space

The building blocks of the functional-spatial environment (see Figure 74) correspond to LYNCHS preferred characteristics. In the MAM they are implemented as concrete structural measures. Their use is to be understood as a milieu therapeutic measure214 , for example as follows:

building blocks	ÿ	*construction measure*	ÿ	*milieu therapeutic measure*
Boundary lines	ÿ	Path limitation by clarity and contrasts	ÿ	Security
Focus	ÿ	Design and dimensioning	ÿ	Frequent control

readability

The building blocks of the readable environment (see Figure 75 1a.-1e.) are those forms by means of which the characteristics in the urban space can be mapped. They help to define the space in the
To be able to differentiate the process of *cognitive mapping* . For example, in the MAM
a dominant spatial object is used to attract attention and
Several spatial objects are arranged at certain distance intervals in order to – in the
Mobility itself – to promote awareness of movement.

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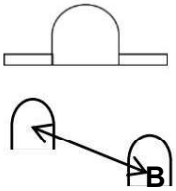
[213] See Lynch (1965).
[214] Milieu therapy is a collective term for therapeutic procedures that aim to positively influence the patient by transforming his or her material, social and spiritual environment (Wenninger, 2001).

building blocks ÿ *construction measure* ÿ *milieu therapeutic measure*

dominance ÿ ÿ Attention generation

distance interval ÿ ÿ Movement awareness



a

u

The MAM can be seen as an endless course that has successive and interlinked

d

offset landscape objects that serve the perception, orientation and

i

mobility of the person with dementia. The aim is to enable the walker *to socially interact,*

c

To experience *independence* and *security* . In addition, the structure of the MAM is designed to offer

h

coordination exercises , avoid overstimulation and

t

to provide *guidance* using the typology of the endless path .

e

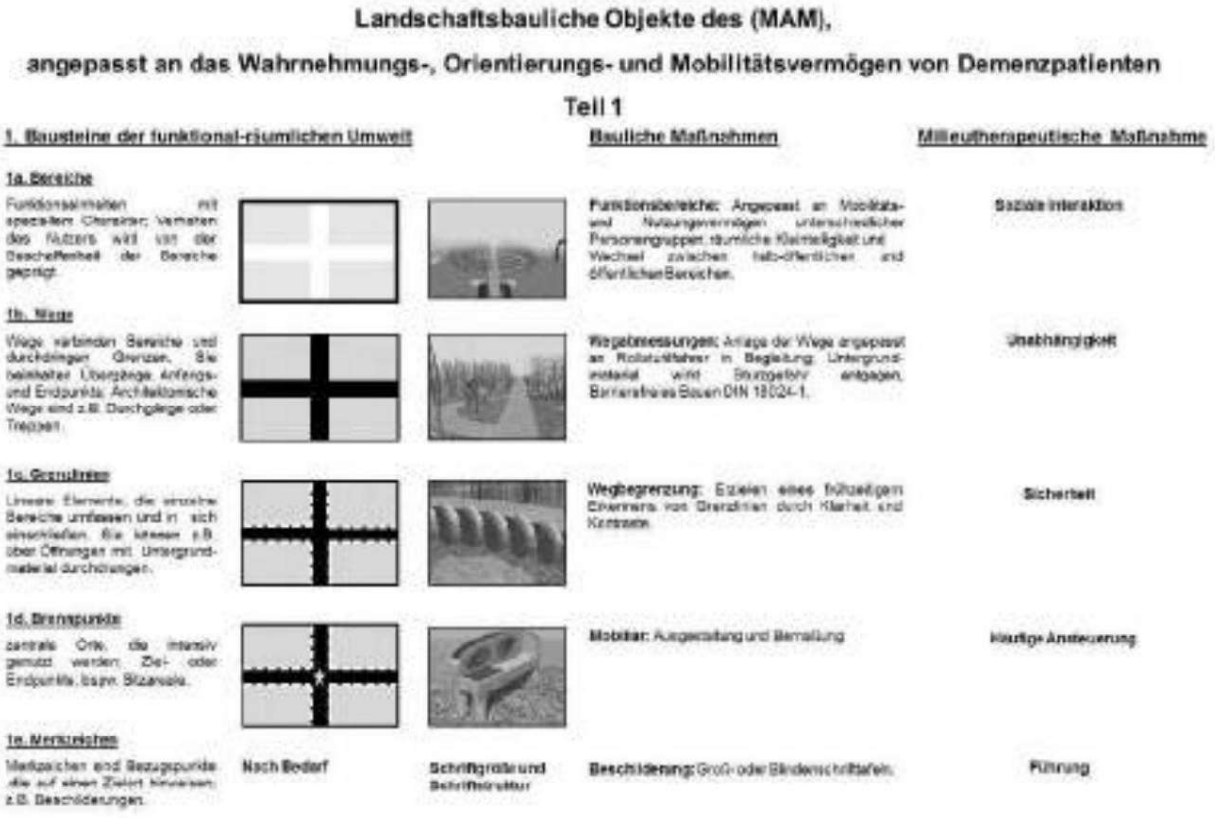


Figure 74. Landscape objects of the MAM as building blocks of the functional-spatial environment.
Source: Categories 1a-e, Lynch (1996); MAM scheme and illustrations, Teimann

Figure 75. Landscape objects of the MAM as building blocks of the readable environment.
Source: Categories 2a-e, Lynch (1996); MAM scheme and figures, Teimann

b) Practice modules

The MAM can be used with integrated exercise modules as part of a planned therapy room for the operation of elderly care facilities. The Consideration of therapy rooms in nursing home construction is legally binding.

The HeimMindBauV (Ordinance on minimum structural requirements for nursing homes, Old people's homes and nursing homes for adults) stipulates that the operation of Facilities must have therapy rooms for senior care.

Section 17 states that

> "[...] every facility must have a room for exercise therapy or gymnastics unless suitable gymnastics and therapy rooms within a reasonable distance outside the facility can be used regularly by the residents.
> Common rooms according to § 16 can be used for this purpose."215

215 See URL: http://www.gesetze-im-internet.de/heimmindbauv/__17.html, service provider within the meaning of the TMG, legal information system (CC-RIS), (06.12. 2013, 10:22h).

Section 16 further states that in

> "[...] facilities with more than 20 residents […] a usable area of at least 1 m2 per resident […]."216

When considering open spaces as alternative or additional therapy spaces, the The nature of planning and building material modules must be adequately considered. When developing individual installation modules of the (MAM), it was important that a Person with mild to moderate dementia is encouraged to – even without accompaniment – to exercise physically outdoors. In addition, the recommendations of the Barrier-Free Construction in the NRW State Building Code.

The following aspects were taken into account when developing the exercise modules:

(1) low-threshold performance requirements (walking/striding/selection of direction of movement/maintaining physical condition),
(2) sensorimotor stimulation through a special selection of plant and natural materials,
(3) motor retrieval of the functional relationship between perception and motor response and

(4) optional physiotherapeutic exercises (gait training/hand-foot coordination).

practice module	**Fig.**	**design and dimensioning**	**Therapeutic alignment**
1. Robinia posts	77 to 78	3 wooden posts as grown, 2.20 m high and with a diameter of 0.15 m; they are set in a round raised base with a slope exceeding the recommended 6%.	hand-foot coordination balance exercise
3. Stone blocks in coarse-grained to fine subsoil material	79 to 80	Combination: boulder and soil type such as lawn, wood chips, bark mulch, sand and gravel (barrier-free construction, DIN 18024-1 green area, playground).	gait school promotion of gross motor skills and safe setting of individual steps
3. Lawn bench	81 to 82	Adapted dimensions for people with reduced mobility of 0.53 m height and 0.34 m seat depth.	Sensorimotor stimulation at rest

[216] See URL: http://www.gesetze-im-internet.de/heimmindbauv/__16.html, service provider within the meaning of the TMG, legal information system (CC-RIS), (06.12. 2013, 10:22h).

4. Willow arches with handrail combination	83 to 84 Two vegetal arches, which frame centrally cranked	handrails, which have a diameter of 30-45 mm and with a height of 0.85 m (dimensions according to barrier-free construction DIN 18025).	spatial orientation therapy
5. Handrails with undergrowth	85 to 86 Two cranked handrails with the	Diameter of 30-45 mm and the Height of 0.85 m (dimensions according to Barrier-free construction DIN 18025); Undergrowth *Cotoneaster* and its species as well as *Carex pendula.*	Promoting tactile perception through Coating the lower leg extremities using plant material

Figure 76. Overview of the MAM exercise modules in relation to the structural purpose and therapeutic orientation. © 2010, S. Teimann, Equipment for the Disabled.
Source: Teimann

design and dimensioning

3 wooden posts, 2.20 m high as grown and with a Diameter of 0.15 m; they are in a round raised embedded in the subsurface, inclination over the recommended exceeds the limit of 6%

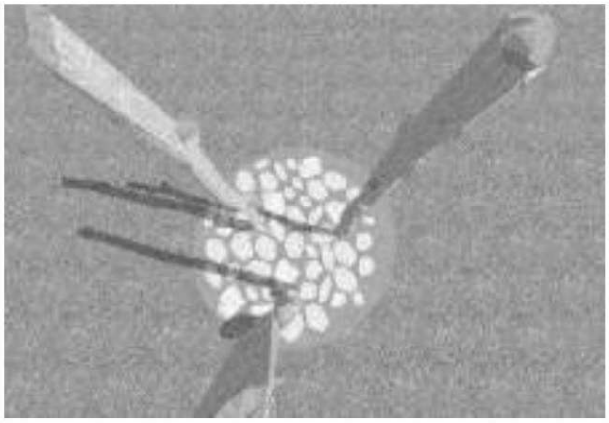


Figure 77. Robinia posts training module, 3-D view 1. © S. Teimann.

Source: Teimann

Therapeutic Orientation

hand-foot coordination, balance exercise

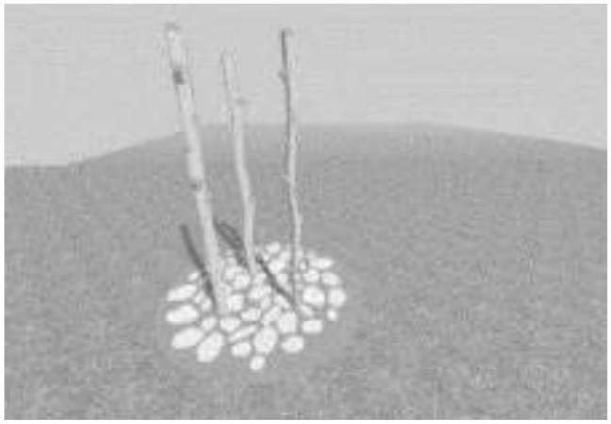


Figure 78. Robinia posts training module, 3-D view 2. © S. Teimann.

Source: Teimann

design and dimensioning

Combination: boulder and
Soil type such as lawn, wood chips, bark mulch, sand and gravel (Barrier-free construction, DIN 18024-1 green area, playground)

Figure 79. Stone blocks training module, 3-D view 1. © S. Teimann.

Source: Teimann

Therapeutic Orientation

gait school

Promoting gross motor skills and the safe placement of individual steps

Figure 80. Stone blocks training module, 3-D view 2. © S. Teimann.

Source: Teimann

design and dimensioning

Adapted dimensions for people with limited mobility of 0.53 m height and 0.34 m seat depth

Figure 81. Training module lawn bench, 3-D view 1. © S. Teimann.

Source: Teimann

Therapeutic Orientation

Sensorimotor stimulation at rest

Figure 82. Training module lawn bench, 3-D view 2. © S. Teimann.

Source: Teimann

design and dimensioning

Two vegetal arches, which are centrally cranked Handrails with a diameter of 30-45 mm and the

height of 0.85 m

(Dimensions according to Barrier-Free Construction DIN 18025)

Figure 83. Willow arches with handrail combination, 3-D view 1. © S. Teimann.

Source: Teimann

Therapeutic Orientation

spatial orientation therapy

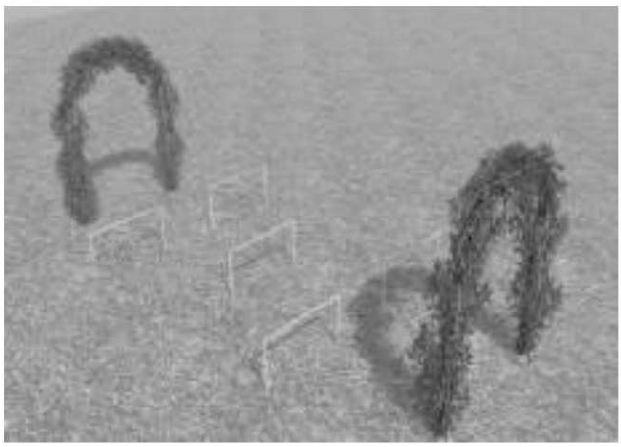


Figure 84. Willow arches with handrail combination, 3-D view 2. © S. Teimann.

Source: Teimann

design and dimensioning

Two cranked handrails with the
Diameter of 30-45 mm and height of 0.85
m (dimensions according to
Barrier-free construction DIN 18025);
Undergrowth *Cotoneaster* and its species
as well as *Carex pendula*

Figure 85. Stone blocks training module, 3-D view 1. © S. Teimann.

Source: Teimann

Therapeutic Orientation

Promoting tactile perception by stroking
the lower leg extremities using

plant material

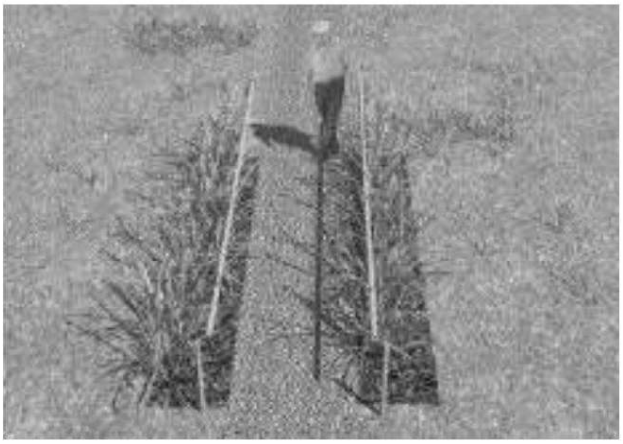


Figure 86. Stone blocks training module, 3-D view 2. © S. Teimann.

Source: Teimann

6.1.3 Public Dementia Trail

The public dementia course is an everyday and practice-oriented experience space in the size
of around 900 m² for seniors and dementia patients in care facilities and rehabilitation centers
intended to be able to carry out rehabilitation medicine measures in the therapy free space. In addition, it should be
considered whether functional therapeutic
Open space planning in general for public and semi-public urban spaces as
local dementia courses or could be used efficiently at other spatial scales –
especially under the premise of increasing mobility and quality of life in urban areas.
Until the final conclusion of this work, it is methodically worked out why
it is effective in the sense of a new demographically stable *urban space management ,* a
functional-therapeutic network of spaces, paths and areas between district care stations
to be provided on the basis of a MAM, among other things.

6.2 Implementation of the dementia outdoor facility in the village - *Living in old age*

The results of the use-oriented analysis of existing open spaces for dementia and Alzheimer's disease (see Chapter 5.4) as well as general experiences from past Misplanning of dementia gardens leads to the design of the village *living in old* age Theodor Fliedner Foundation in Mülheim an der Ruhr. The design for the dementia outdoor facility In the model project “Urban spaces for a healthy age – 2011-2013” (UDE) the creation of mobility incentives adapted to the needs of dementia patients. primarily takes into account the abilities of people with mild to moderate Dementia. This fact is due to the fact that this phase of the disease in the The percentage distribution of the individual In this study, the severity of dementia was broken down as follows: mild dementia – 41.3%, moderate dementia – 30.4% and severe dementia 28.3%.

The socio-biographical background of the residents is typical for the Ruhr area, as it includes both rural as well as urban. For this reason, the planning focused on *Mobility in nature* is included as well as the aspect of *independent horticultural Activity.* For the future location, a 1300 m² area was planned at the lower outskirts of the village (see Figure 88, top right). It closes to a residential building that was built in 1994. Attached to the residential building is a Parking lot, and an existing path leads from 2 sides to the designated Building area. Previously, the area was used extensively as an orchard. In the existing The vegetation includes several years old willow trees, which were planted during the construction of the facility. were left at their location. The building as well as the area can be converted into a adjacent landscape conservation area can be viewed.

Figure 87. Future location of the dementia garden.
Source: Teimann

6.2.1 Employee participation and requirements

For the process control of the construction implementation project and for the 6-month Intervention and application phase, a planning working group and a Working group of TFS employees formed. Taking into account the structural For the new living and therapy room, 5 aspects were considered with milieu therapeutic relevance, namely

(1) independent accessibility,
(2) perception-based zoning, which is linked to the development of further social Meeting spaces, (3) spaces for visual-haptic sensory impressions, (4) the enclosure without an atmosphere of closure and
(5) Offers in the open space that maintain the competence of those affected.

Concrete planning elements such as rest and retreat rooms, changes of visible areas and small niches, water features, a walk-in Viewpoint towards the landscape conservation area and exercise modules for Activity promotion. In addition, a milieu therapeutic gardening program was developed, which is based on the seasons to strengthen the connection to nature. A total of 55 Employees of the TFS and the Social Services directly or indirectly involved in the overall process involved.

6.2.2 Draft

The park-like design for the dementia outdoor area (see Figure 88) has the motto “The Reverse Mikado – The one who moves first wins” and is thematically based on the guidance system implemented in the village with large-format Mikado sticks. It also highlights the importance of mobility. The design is in keeping with the adjacent Residential building (Am Mühlenhof 110). The octagonal path system and the round The edging of the outdoor area corresponds with the curved building construction of the adjacent residential building (architect: Hinrich Baller). With the permeable The overall impression of the outdoor area remains the view into the The structural aspects of the design are zoning and Contrasting, planting and the guidance system that leads the residents from the edge of the village to the surface.

a) Zoning and contrasting

zoning

The series connection of functional zones (see Figure 88, bottom left) is
necessary to meet the needs of residents for open space with their urban and
The Zone I – *space of open tranquility* – invites you to enter with its manageable size and nature of the garden elements. Depending on the
Depending on your wishes and fitness level, you can visit Zone II – *Encounter in Movement* – to do physical exercises on the modules set up there. Finally, the tour leads to Zone III – *Ecological Allotment Garden Culture.* The boxwood trees planted there
(Buxus sempervirens) bordered beds offer the possibility of active gardening.

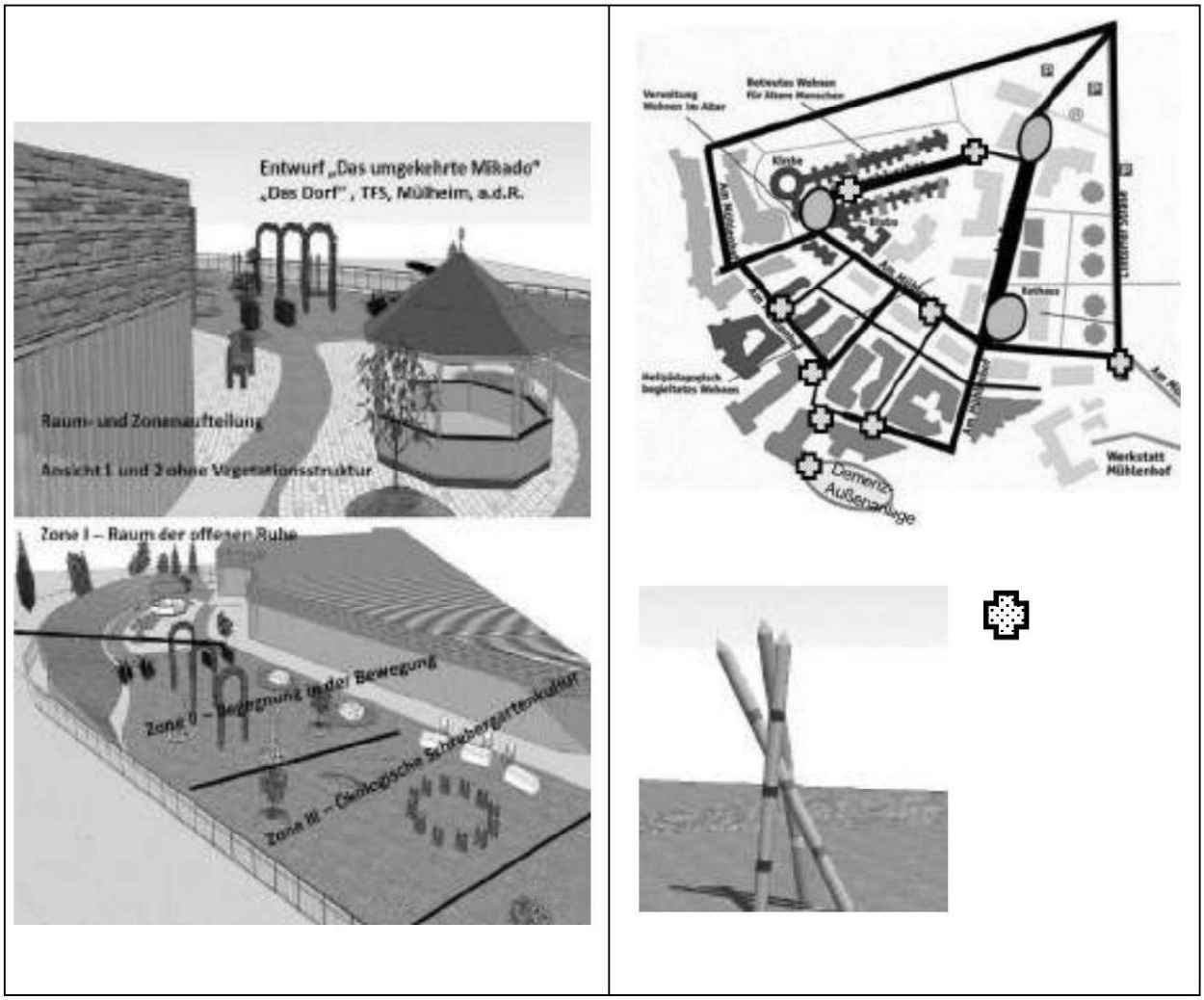


Figure 88. Site plan of the dementia outdoor facility in the "Living in Old Age" village.
Top left and bottom: design "The reverse Mikado"; bottom right: guidance system "Mikado sticks";
top right: village map with dementia outdoor area and guidance system. Source: Teimann, modified after TFS
Source: Teimann

Zone I

Zone I – *space of open rest* – is safety-compliant by means of a green earthen wall
The wall was built up with material from the excavated earth.
A large hornbeam hedge borders the earthen wall. The garden boundary is
designed in such a way that the residents cannot leave the garden on their own. Only
From the residential building behind it, they can safely enter and exit the complex
A modern, Asian-style pavilion is the only and necessary
Sun protection permanently mounted. From a design point of view, the pavilion takes up the
design of the adjacent building with the wave-shaped roof. The element
Water is available in the form of a spring stone device that is only a few centimeters deep
The circular path made of cobblestones and water-bound soil cover is
Village character adapted; it has a width of 1.7 to 2.0 meters and is partly covered with
appropriate handrails in the recommended DIN standard for barrier-free construction.
The use of space depends on the expectations of the dementia patient. The principle
The design adheres to openness and clarity in form and size. This ensures that the dementia
outdoor area is easy to see as soon as you enter.

Zone II

Zone II – *Encounter in Movement* – contains modules made of plant and natural materials for
use in physiotherapy and occupational therapy exercises that help maintain
individual muscle strength, gait stability and fine motor skills. In the development
The individual installation modules were designed to ensure that a person with mild to
moderate dementia feel encouraged by the modules to exercise outdoors without supervision.
The exercise modules of the prototype (MAM) were used in this
Zone implemented.

Zone III

The last area, Zone III – *Ecological allotment garden culture* – is for those people
The activity time is intended for people who prefer to be active.
one hour per day. This duration of exercise is at a low threshold level, but
already provides a positive stimulation of the cardiovascular system. The plans include
manageable boxwood beds with marigolds *(Calendula officinalis),* wild marjoram
(Origanum vulgare), phlox *(Phlox spec.),* large-leaved sorrel *(Rumex rugosa)* and
Hyssop *(Hyssopus oficinalis).*

contrasting

Contrast is a design tool that promotes visual perception. General
It should be said that this applies to neuro-ophthalmologically impaired persons as well as to
Persons with normal vision. As discussed in detail in Chapter 2.2.3
When planning, it must be taken into account that for orientation in the room the
Maintenance of a *continuous information chain* must be ensured.

> "A continuous chain of information is the basic requirement for safe mobility and for correct orientation in public space. The continuity of an information chain on the way from A to B includes the consistency of the design [...] as well as the analogue marking of the return route by elements that contain information. The planner of contrasts must also take this into account when designing markings, signposts, floor indicators, etc. The system must also be tolerant of user errors. Paths taken incorrectly or preferences for certain paths must not lead to the user suddenly becoming disorientated and thus helpless."217

In addition, it is necessary to create *contrast in transition areas .*

> "The quality of information through contrasts is particularly evident in transition areas [...] where differences in level are overcome [...] where changes in space take place. [...] However, 'too much' information through too many different contrasts easily leads to confusion and overload. In order to do justice to both, the focus of contrast planning should be on the continuity of contrasts and especially on transition areas."218

Transferred to the open space to be planned in the area of the TFS test site, this means
this meant that manageable and largest possible contrast areas had to be created,
on the one hand by the choice of floor coverings and on the other hand by the type of
Path design in demarcation from the surrounding area. Light paving material was used in a
Path width of 1.7 to 2.0 meters is used. Light granite paving closes the
Path design on the sides. In the middle of Zone I, the bright path
adjacent to a dark water-bound cover and lawn towards the site boundaries
Here, the aim was to achieve a calm, contrasting area division, which
to encourage the pedestrian to continue his mobility processes. Figure 89 shows
Sections of Zone I as they appear when entering the site. The
The image details highlighted illustrate the extent to which the overall surface structure is influenced by visually
prominent contrast areas can be highlighted for the viewer.

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[217] Pro Retina Deutschland eV (2012), p. 21.
[218] Pro Retina Deutschland eV (2012), pp. 21-22.

Figure 89. Representation of visually prominent contrast areas when entering Zone I of the completed dementia outdoor facility of the TFS.
Source: Teimann

b) Planting

The planting supports the open, park-like character of the green area.
The foreground is a distinctive spring blossom and a grassy landscape in autumn. A
Low maintenance requirements were the main requirements for the plant composition.
A total of 12 plant species were selected, which are listed in Figure 90.
Mainly native shrubs and perennial plants were used, including valuable
Plants such as the common camphor *(Staphylea pinnata).* The white-flowering ornamental shrub of
1-3 meters in height is currently protected due to its rarity (see
Figure 91). Perennials that can be easily viewed by people in wheelchairs due to their height
and can be touched were also chosen, for example the torch lily *(Kniphofia*
spec.) and the fragrant azalea *(Rhododendron luteum)* with a growth height of around 1.4 metres.
The use of poisonous plants219 in dementia gardens is to be ruled out in principle. Because in dementia
In individual cases, it may happen that parts of plants enter the body through uncontrolled consumption.
digestive tract. Other plants can cause poisoning or
Can cause burns, such as hogweed *(Heracleum spec.).*

[219] See URL: http://de.wikipedia.org/wiki/Liste_giftiger_Pflanzen (20.02.2014, 11:14h).

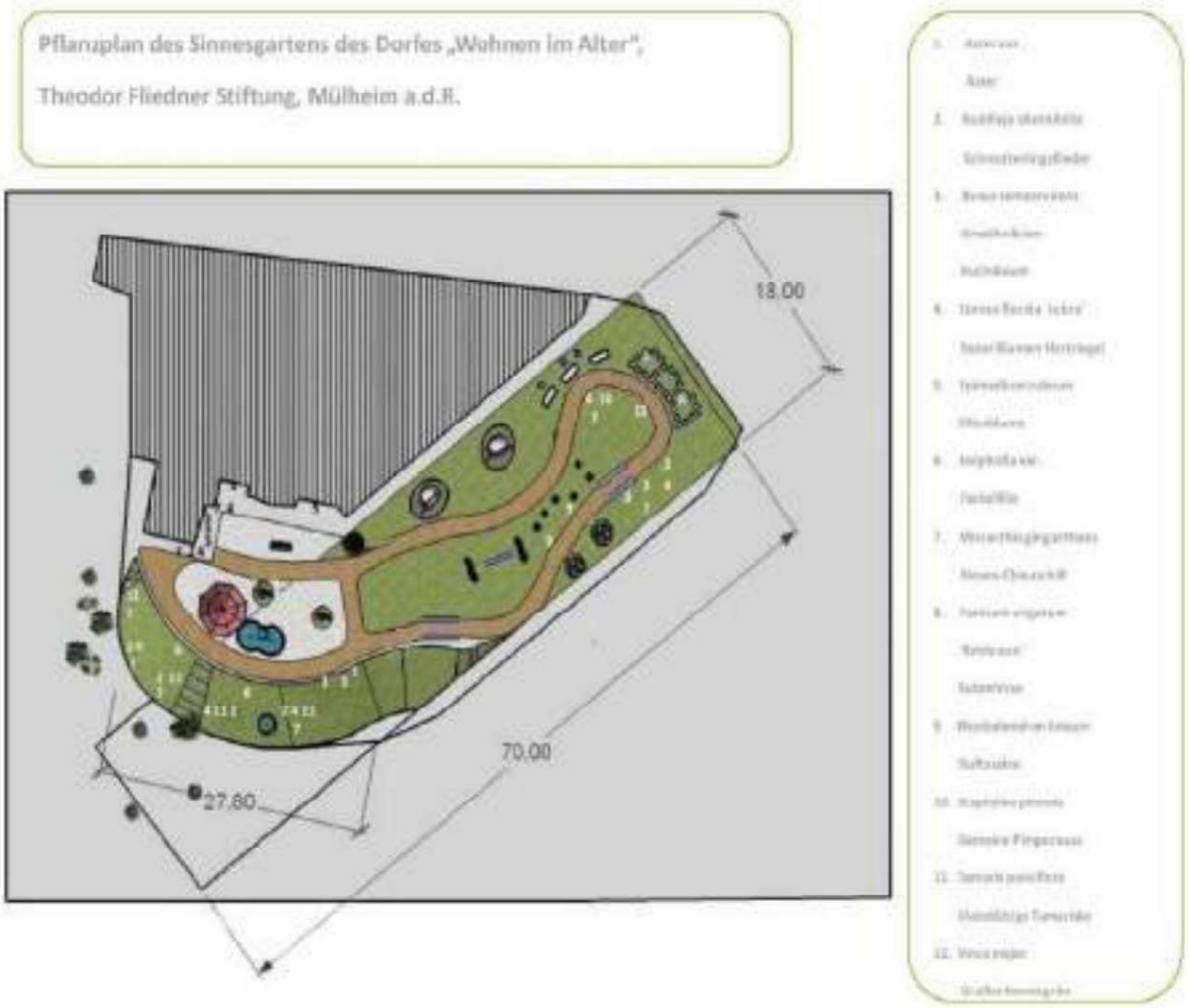


Figure 90. Planting plan for the dementia outdoor area of the village "Living in Old Age" called "Sensory Garden".

Source: Teimann

Figure 91. Common pimpernel.
Source: Teimann

Figure 92. Torch lily.
Source: Teimann

Figure 93. Fragrant azalea.
Source: Teimann

An essential feature of outdoor facilities for people with dementia is flexible

Raised beds that wheelchair users can be pushed close to for gardening.

Vegetable beds and soft fruit orchards are also important garden elements. Different

Seasonal plantings provide open spaces through which one can experience more of one's own competence.

Figure 94. Flexible raised bed setup.
Source: Teimann

Figure 95. Correct raised bed height.
Source: Teimann

Figure 96. Vegetable beds with soft fruits.
Source: Teimann

To Figures 94 to 96

The correct accessibility of the plants is necessary. One possibility is the Installation of flexible raised beds from Metal. In this case they were set up in a spacious pavilion. This offers several hours *of table Gardening* sufficient sun protection. When dimensioning the raised beds, a construction that is so is designed so that wheelchair users can legs directly under the planting areas can drive (here: H/W/D in cm = 900/1200/1200). This increases the working comfort. Seasonal planted vegetable beds are Occasion to meeting and delivery topic of conversation.

c) guidance system

In order to establish a comprehensive guidance system, *Mikado sticks* were installed at 9 locations in the village. *Ensembles* were built as guidance system objects. The intention was to provide as many different Groups of people – coming from all directions in the village – by means of recognizable Object repetition to show the way to the dementia outdoor area. Three 3.30 meter high robinia posts were placed *in a Mikado-like* bundle. RAU220 gives in “Barrier-free Building for the Future” the placement heights of objects or marking boards for a comfortable view with 1.20 to 1.60 meters. In this case, the object was at eye level with a board and the individual posts additionally with blue, yellow and green stripes. The colors serve to make the object stand out more clearly from the background. Figures 97 and 98 show by way of example that the control system objects

[220] See Rau (2011).

To guide the visitor from position to position in the village. It should be noted that the objects at crucial turns and not too far apart from each other.

Figure 97. "Mikado stick ensemble" as a guidance system element and spatial orientation tool, implemented in the project "Urban spaces for healthy ageing" (UDE), built in 2012.
Source: Teimann

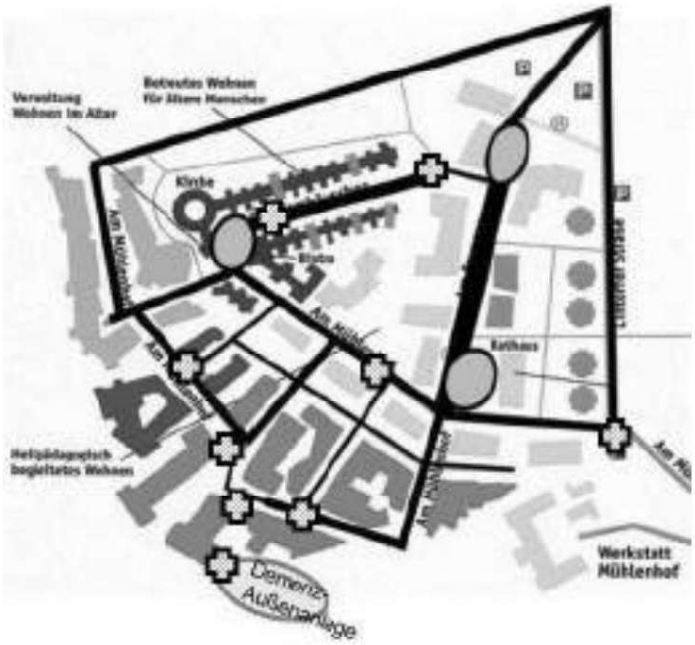


Figure 98. Village map with guidance system with 9 guidance system locations

Source: Teimann, modified from TFS

Figure 99. Mikado sticks erected in the north towards the church square.
Source: Teimann

Figure 100. West of the town hall positioned Mikado sticks in the direction of the adjacent residential building near the dementia outdoor area.
Source: Teimann

A sign attached to each Mikado ensemble indicates the route with arrows
The sign is a supplementary tool that helps with direction decisions.

Figure 101. Signage of the guidance system.
Source: TFS

The following guidelines are recommended for font heights in guidance systems:
(1) If recognition from a distance of 5 m is desired, a font height of
from 9 to a maximum of 18 cm, and (2) in the case of signage in closed
A character height of 0.5 cm is to be adopted if a reading distance of 30 cm
is present.

6.2.3 Milieu therapeutic curriculum program

The functional-therapeutic open space concept consists of 2 parts. Firstly, the
specially built surrounding area, which was described above, and on the other hand from a
milieu therapeutic application program for resident support.

With its reference to milieu therapy, according to which the personal environment is also one of the
therapeutic influencing factors, the free space concept includes a curriculum
Training program that introduces the people on site to the model project and prepares the
sensitized to the correct handling of dementia patients outdoors.

70 people were trained before the intervention phase. They were divided into 3 groups. These were

(1) qualified nursing staff with 45 persons,
(2) social workers with 10 people and
(3) Volunteers and family members with 15 persons.

For the intervention phase of the study, the subjects in the test group
During the six-month intervention period, an average of 1 hour per day was spent on
Staying outdoors – with mobility exercises or nature-oriented occupational therapy.

	Mild dementia	Moderate dementia Severe dementia	
activity	Independent walking	reduction of urge to move	Increasing the amount of time spent outdoors
exercises	mobility in small groups	step training gait school basal stimulation	Deep sensitization through natural sitting materials
emotion	Gardening with Family Members	Change from physical tension and relaxation	Release of physical Tensions caused by seizing plant materials
Perception Seasonal	Biography Work		light-shadow alternation for visual stimulation

Figure 102. Fields of activity of dementia patients in the dementia outdoor area of the TFS.
Source: Teimann

program	intensity	duration of the intervention
stay and/or mobility exercises outdoors	Maximum 4 hours / week	6 months (March to September)
nature-oriented occupational therapy	2-3 hours / week	6 months (March to September)

Figure 103. Types of employment within the framework of the functional-therapeutic free space concept for the intervention phase.
Source: Teimann

The program content consists of a theoretical and a practical part.
The theoretical part covered the progression of dementia, perception of dementia and the staff
The development of
Therapy gardens, the use of dementia gardens in North Rhine-Westphalia and the future
Zone use of the dementia outdoor area in the Fliednerdorf. Aspects of the practical part
were conversation skills in contact with dementia patients, tips for the use of
Plant parts in indoor and outdoor areas, preparation of light gardening
Activities, carrying out the exercises on the installation modules and setting up
of seasonal action programs in the open space such as anniversaries, seasonal festivals – rose or
Tomato festival – or beach parties. As part of this curriculum training program,
Working groups were formed to evaluate the benefits and
Structure of the dementia outdoor facility and in role plays the professional support
and instruction of the subjects.

Figure 104. Overview of the contents of the curriculum training program for TFS employees, social services, volunteers and family members.
Source: Teimann

7 Interdisciplinary analysis and data evaluation

The project group *Urban Spaces for a Healthy Age (UDE),* consisting of the
Research Unit (FE) Urban Planning and Geriatrics, has focused on the overall methodology
agreed on the following items of investigation:

- *Psychological status* in dementia before and after 6 months of dementia garden use,
- Recording the duration of *use* during the test depending on physical and social conditions such as distance from living space, weather conditions and social offerings,
- *Memory performance* in relation to the various spatial objects (new Survey instrument: 3-D cognitive mapping) and
- *Relatives' satisfaction* after the *dementia garden* in the neighbourhood measure.

The *dementia garden* measure is used as a complementary non-pharmacological treatment approach
The focus of this study is the influence of interior design on the
Mood picture of those affected and the associated satisfaction of their relatives.

In addition, a new method for measuring the effectiveness of individual architectural
elements were introduced and examined. In the future, 3D cognitive mapping will be used to
a simple way of assembling spatial objects for the
Open space design draws on a pool of dementia-friendly and validated modules
can be.

Within the study *Urban Spaces for Healthy Aging* (UDE), 61 test subjects
the possibility of a dementia garden for 6 months as a functional-therapeutic
Free space concept and as a model of a therapeutic center to visit alone or accompanied.
A broad range of data was collected within this experimental setting. The analyses were carried out
both quantitatively and qualitatively.
At the time of recruitment, a total of 210 senior citizens lived in the *village – Living*
in old age (TFS). Of this proportion of residents, 130 people were affected by dementia.
After a survey of relatives on study participation by the facility management,
For the overall study, 61 test subjects with dementia were recruited, of whom 53
people were available as potential test subjects until the end of the intervention.
From this total group size, subgroups with 4 methodological survey instruments were created with

different sizes were used, since the daily study participation of the subjects on

was voluntary or participation was not possible.

The condition of participation

- Diagnosed dementia
- level of resilience
- No aphasia
- Written consent of relatives

exclusion criterion

- Excessive motor and cognitive deficits

The hypotheses can be divided into four blocks:

MOOD OF THOSE AFFECTED

- **H1.1:** Spending time in dementia-friendly open spaces leads to an improvement in depression among residents with dementia in the neighborhood.
- **H1.2:** Spending time in dementia-friendly open spaces has a positive influence on affect[221] among residents with dementia in the neighborhood.

PHYSICAL AND SOCIAL CONDITIONS

- **H2.1:** A short distance from the home to the dementia garden increases the duration of use.
- **H2.2:** The level of air temperature has an influence on the service life.
- **H2.3:** The level of humidity has an influence on the service life.
- **H2.4:** Social activities in the dementia garden increase the duration of use.

REVIEW AND APPLICATION OF 3D COGNITIVE MAPPING

- **H3.1:** The memory performance regarding spatial objects in 3D cognitive mapping shows a correlation with the degree of cognitive decline.
- **H3.2:** Memory performance in 3D cognitive mapping differs with respect to individual objects.

RELATIVE SATISFACTION

- **H4:** Dementia-friendly outdoor facilities increase family satisfaction.

[221] Affect = emotional excitement with a physical and motivational expression dimension, cf. URL: http://de.wikipedia.org/wiki/Affekt (July 28, 2014, 4:28 p.m.).

The method overview of interdisciplinary data collection is as follows:

research unit (FE)	**geriatrics**	**urban planning**	**urban planning**	**geriatrics**
method	1. Neuro-psychiatric diagnostics	2nd questionnaire *application mode "Dementia Garden"*	3. 3-D cognitive mapping	4. *Effectiveness* Questionnaire *"Dementia Garden"*
focus	**depression**	**useful life**	**memory performance regarding various spatial objects**	**family satisfaction**
analysis	**quantitatively**	**quantitatively**	**quantitatively**	**qualitativ**
measurement parameters	HAMD, MADRES and Affect	duration of dementia garden use, Distance to housing, social Offers, air temperature and humidity	Comparison of Memory performance in relation to the severity of dementia	Parameters for effectiveness of measure *Dementia garden* in neighborhood
survey instrument	HAMD/MADRS: Questionnaires with clinical foreign assessment questions Affect: Daily Protocols	daily reports	Oral interview after intervention phase	Written postal survey with answer templates
sample sizes (N)	HAMD: 54 MADRS: 50 affect: 58	2933	29	35

Statistics programs:

IBM SPSS Statistics - Version 22 and the online calculator CoCor222

Test procedure:

1. t-tests for dependent samples: HAMD and MADRS values

2. Wilcoxon Matched Pairs Test: Affect before versus after the dementia garden tour

3. Spearman rank correlations: correlation between usage time and motivation

4. Linear regression: distance *house-garden* (in meters), age, MMST value, usage time (in minutes), number of tours

5. Pearson Product Moment Correlations: Correlation between service life and humidity, correlation between usage time and air temperature, correlation between usage time and social activity, MMST-Value and hit sum of the memory performance for the different spatial objects

6. z-tests: Comparison of the above-mentioned Pearson correlations for weather data and social activity

[222] See URL: http://www.comparingcorrelations.org (14.08.2014, 11:51h).

1st method

FE: Geriatrics

Neuro-psychiatric diagnostics

Questionnaires with clinical assessment questions (Appendix 1-2) and daily protocols (Appendix 3)

Intervention measure: Dementia garden use

Focus: Depression

Study design: Prospective study with a test group; sample design with follow-up based on

multiple measurement variables and measurement times

1. Measurement parameters: HAMD and MADRS

Sample size: HAMD, N = 54; MADRS, N = 50

Measurement times: T1 - before the start of the measure, T2 - after 3 months and T3 - after 6 months

2. Measurement parameter: affect

Sample size: N = 58

Measurement times: daily

Analysis: Quantitative

In order to assess the psychological status during the intervention phase, the first
Method a prospective study with a test group was used and the depression
measured at 3 measurement points (T1, T2 and T3). This prospective study will
Sample prospectively - with respect to the hypothesis formulated beforehand - during the
Dementia garden use into the future. Since it was assumed for this study,
that up to 50% of the subjects die during the 6-month intervention period
only one test group was chosen. The aim of this method was therefore
to examine psychometric measurements per participant and their change over time.
In addition, the focus was on psychological well-being and not on cognition
because no effect on cognitive parameters was observed during an intervention period of 6 months
was to be expected.

For the measurement of depression in old age, the clinical assessment scales used were
Hamilton Rating Scale for Depression (HAMD) and the *Montgomery-Asberg Depression Rating Scale* (MADRS) are
used. The Hamilton scale223 consists of 17 to 24 questions, for example
to feelings of guilt, various types of sleep disorders, hypochondria or suicidal thoughts. The Montgomery-Asberg
Depression Rating Scale224 is a complementary

[223] See URL: http://de.wikipedia.org/wiki/Hamilton-skala (July 28, 2014, 4:28 p.m.).
[224] See URL: http://www.unifr.ch/ztd/HTS/inftest/WEB-Informationssystem/de/4de001/abafa2ed242211d58b620001028b2ad7/hb.htm (07/28/2014, 4:28 p.m.).

follow-up questionnaire consisting of 10 questions to measure the severity of depressive episodes in patients with affective disorders. The range of Mood changes in depression are recorded. This can range from depression *with accompanying anxiety* to *depression with elevated mood.225* The The questionnaires used to record the HAMD and MADRS values are available at Appendix 1 to 2. In addition, values for affect as emotional arousal are given with a physical and motivational expression dimension over the entire intervention period (T1 to T3) using daily protocols (see Appendix 3, subsection 4). The study referred to the following subscales of affect: *tension, calm, stability and Euphoria.*

2nd method

FE: Urban Planning

***Application Mode* Questionnaire (Appendix 3)**

Daily protocols collected by study staff

Intervention measure: Dementia garden use

Focus: Service life

Measurement parameters: Dementia garden use (hours), distance to living area (m), social services (frequency, yes/no), air temperature (°C) and average relative humidity (%)

Sample size: N = 2933

Measurement times: daily

Analysis: Quantitative

The second method was used to collect data that provide information about the *application mode* of the dementia garden and will address aspects of local mobility in the neighbourhood. The data The evaluation of the daily protocols of the Research Unit (FE) Geriatrics (see Appendix 3). The focus of the urban planning analysis was on the general and specific service life depending on physical and social conditions.

Using the second method, the length of stay of people with dementia in the Free - which extended over the course of half a year - and then assigned to dementia groups (= severity of dementia).

[225] See URL: http://www.icd-code.de/icd/code/F30-F39.html (07/28/2014, 4:28 p.m.).

With this method it was explicitly possible to 1. Measure units such as usage time in hours or number of rounds in relation to distance to living space, age and cognitive status and 2. the duration of use depending on the use of social services and weather conditions.

The result of the quantitative analysis provides guidelines for dementia-friendly Open space planning in the district (see Figure 126).

3rd method

FE: Urban Planning

3-D cognitive mapping, proactive game with oral tasks (Appendix 4)

Intervention measure: Dementia garden use

Focus: memory performance regarding various spatial objects

Measurement parameter: memory hits per room object

Sample size: N = 29

Measurement times: once after T3

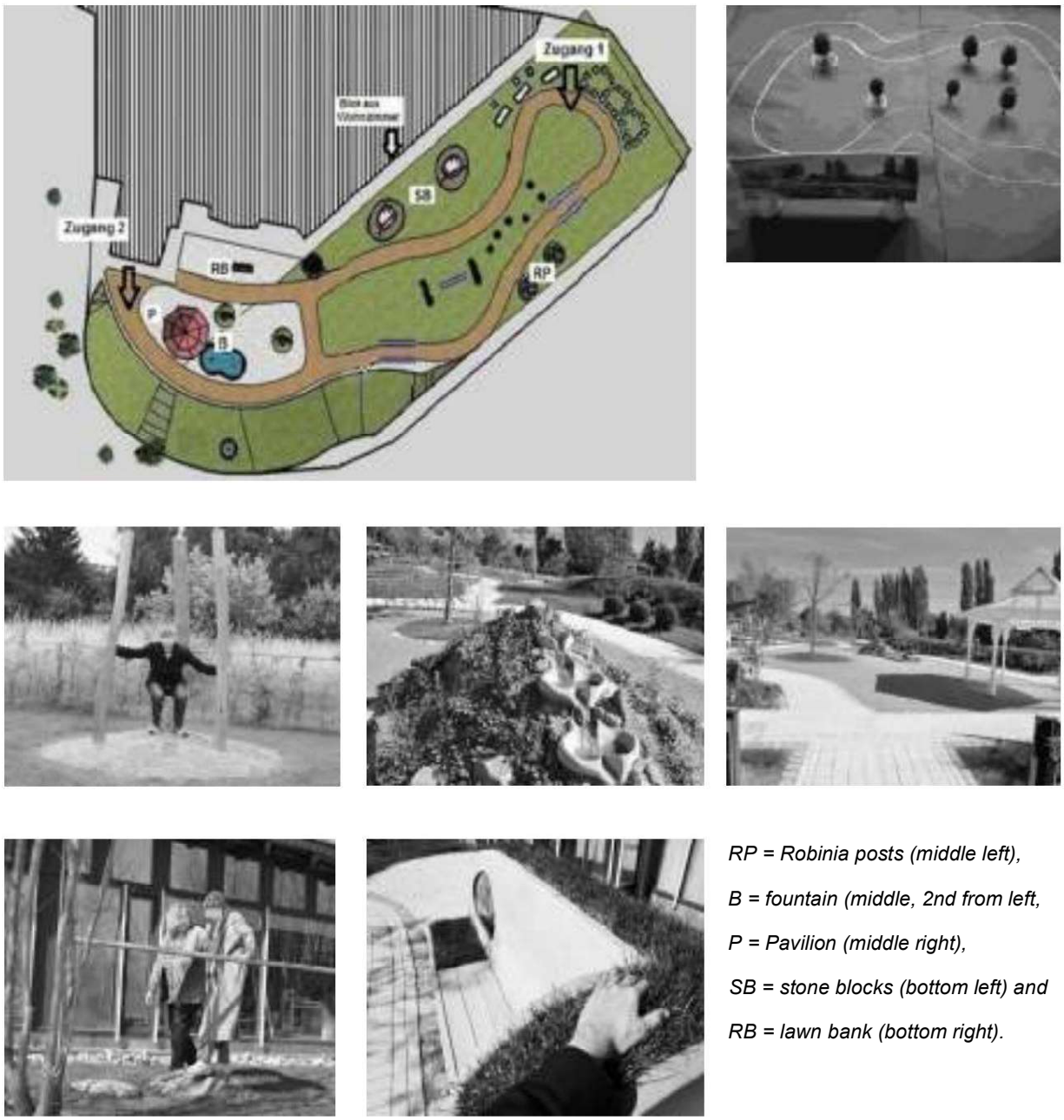
Analysis: Quantitative

In nursing home construction and in neighbourhood development with a focus on dementia, there is a lack of a systematic use of structural elements with which a predictable memory and and therefore also a predictable orientation in space. Structural and planning Measures such as the use of zoned barrier-free areas and visually striking In practice, orientation aids are used alongside each other or in combination. How their respective effect in value and strength, related to a subsequent cognitive Retrieval, differentiation from each other has not yet been empirically proven.

Therefore, the Research Unit (FE) Urban Planning used the 3rd method to create a 3-D Cognitive mapping was developed; a research method for recording the Memorability of individual spatial objects. A pro-active game is considered as A replica of the dementia garden of 1300 m² is used and during the game a Interview is conducted. During this interview, the subjects are asked about their memory regarding the spatial objects used in the dementia garden were examined in three-dimensional space.

To ensure the robustness of the 3D cognitive mapping measuring instrument, it is tested with The established instrument of the MMST (Mini Mental Status Test), which is used within the

Dementia diagnostics are used to determine cognitive deficits.226 The following Figure 105 shows an overview plan of the dementia garden, a view of the 3-D game board as well as the representation of the individual spatial objects.



RP = Robinia posts (middle left),
B = fountain (middle, 2nd from left,
P = Pavilion (middle right),
SB = stone blocks (bottom left) and
RB = lawn bank (bottom right).

Figure 105. 3D game plan overview. Distribution of the spatial objects in the dementia garden (top left), game plan (top right) and photos of the spatial objects as part of the study "Urban spaces for a healthy age".
Source: Teimann

226 See URL: http://de.wikipedia.org/wiki/Mini-Mental-Status-Test "The Mini-Mental-Status-Test is carried out as an interview with the patient. Central cognitive functions are tested using 9 sets of tasks (temporal and spatial orientation, ability to memorize and recall, attention, language and language comprehension, as well as reading, writing, drawing and arithmetic)" (July 28, 2014, 4:28 p.m.).

The measurement in "3-D cognitive mapping" is carried out as follows:

During a questionnaire interview, the subject sits in front of the 3-D game board and is shown 3 questions were asked about the direction of the spatial object in the dementia garden. the 3 questions regarding the performance requirement. The test subject has the opportunity to Direction of the object in space and the object model as a game figure on the 3-D to set the game plan.

The spatial objects are:

1. P = Pavilion, 2. B = Fountain, 3. SB = Stone blocks, 4. RP = Robinia posts and 5. RB = Lawn bench.

During testing, 3 performance levels were recorded:

Level 1 - Object direction was shown correctly (1 point),

Level 2 - Object model was set (1 point) and

Level 3 - Object model was set correctly (1 point).

For the test item *object direction was shown correctly,* the ability of the subject recorded with a physical indication (e.g. with the outstretched arm) the correct Direction of the spatial element has been displayed. The item *object model was set* It is recorded whether the subject was able to make the decision to move the spatial object to the To set a model template and then to carry out the action in the second step. Whether the It is not relevant whether the object model was correctly positioned by the subject. The last Test item *object model was set correctly* describes the process that the test subject could remember the correct spatial orientation. In relation to the dementia groups (= severity of dementia), the hit rates are calculated for 1 hit, 2 hits and 3 Hits per spatial object are recorded. The 3D cognitive mapping provides highly differentiated measurements and was tested on 29 subjects.

4th method

FE: Geriatrics

Questionnaire on the Effectiveness *of Dementia Gardens in the Neighborhood* (Appendix 5)

Written postal survey with scaled response options, questionnaire: *effectiveness*

Intervention measure: Dementia garden use

Focus: Family Satisfaction

Measurement parameters: Parameters for the effectiveness of the *dementia garden* in the neighbourhood measure

Sample size: N = 35

Measurement times: after T3

Analysis: Qualitative

With the 4th method as the final method part, an evaluation of the overall project was carried out – *Dementia garden in the neighbourhood* - carried out by the relatives of the test subjects. It consisted from a written survey based on a questionnaire. This was sent by post to All relatives of the recruited test subjects were sent, most of whose relatives participated at the end of the test. Answering and returning the questionnaire was done on a voluntary basis.

The survey instrument was developed by the Research Unit (FE) Geriatrics specifically for the Model study in the *village - Living in old age* (TFS) was developed. The questionnaire contains 6 questions with 5 possible answers each. Multiple answers are not possible. The assessment contents are: *Dementia garden as a village enrichment, shared use (relative and test person), joint participation in social or milieu therapeutic offers (relatives and test person), frequency of visits, dementia garden as a therapeutic offer* and *test person has benefited from the use of the dementia garden.* The assessment could be in an area of negative to positive consent *(I do not agree* until *I completely agree).* The The questionnaire can be found in Appendix 5. The data were evaluated descriptively.

Part C

8 individual results

For the overall study *Urban Spaces for Healthy Aging* (UDE), 61 test subjects with dementia, of which 53 people were available as potential test subjects until end of the intervention. From this total test group, the 4 methodological survey instruments subgroups of different sizes (N) were used, because the daily study participation of the subjects was voluntary or the participation was not possible.

Before presenting the individual results of the 4 examination methods with final Hypothesis testing is preceded by a description of the total sample.

Description of the total sample

The 61 test subjects recruited were between the ages of 55 and 100. Of these, 16 people were male and 45 people were female. According to the classification scheme of dementia severity according to the *S3 guideline on dementia*[227] (MMST value: 20-26 = mild dementia, 10-19 = moderate dementia and 0-9 = severe dementia) resulted in the following Groups. 12 people were affected by mild dementia, 22 people by moderate dementia and 14 people had severe dementia.

In 13 cases there was no valid MMST value.

8.1 Results on the mood of those affected / depression

HYPOTHESES

- H1.1: Spending time in dementia-friendly open spaces leads to an improvement in depression in residents with dementia in the neighborhood.
- H1.2: Spending time in dementia-friendly open spaces has a positive influence on affect in residents with dementia in the neighborhood.

FE: Geriatrics

1st method: Neuro-psychiatric diagnostics

Questionnaires with clinical assessment questions (Appendix 1-2) and daily protocols (Appendix 3)

Intervention measure: Dementia garden use

[227] See DGPPN (2009).

Focus: Depression

Study design: Prospective study with a test group; sample design with follow-up related to several measured variables and measurement times

1. Measurement parameters: HAMD and MADRS

Sample size: HAMD, N = 54; MADRS, N = 50

Measurement times: T1 - before the start of the measure, T2 - after 3 months and T3 - after 6 months

2. Measurement parameter: affect

Sample size: N = 58

Measurement times: daily

Analysis: Quantitative

Results on the course of the depression scores HAMD and MADRS

The HAMD and MADRS values recorded over the 3 measurement times (T1 to T3) were analyzed using a 3-pair t-test. In both cases,

There was a significant decrease in HAMD and MADRS scores *(p* = 0.017 and *p* = 0.026).

Thus, it can be reported that a significant improvement in depressive symptoms according to the psychometric scales *Hamilton Rating Scale for Depression (HAMD)* and *Montgomery-Asberg Depression Rating Scale (MADRS)* based on the whole intervention period.

	Paired differences					t	df	Sig. (2-sided)
	mean	Standard-deviation	standard error mean	95% confidence interval the difference Lower	Upper			
Pair 1 MMST T1 – MMST T3	2,485	3,692	,643	1,176	3.794	3.866	32	0.001
Pair 2 MADRS T1 – MADRS T3	2,960	9,147	1,294	,360	5.560	2.288	49	0.026
Pair 3 HAMD T1 – HAMD T3	7,593	22,574	3,072	1,431	13.754	2.472	53	0.017

Figure 106. Results of t-tests for samples with paired values of the measurement parameters (MMST, MADRS and HAMD) about the test procedure as part of the study "Urban Spaces for a Healthy Age". Source: LVR (2014)

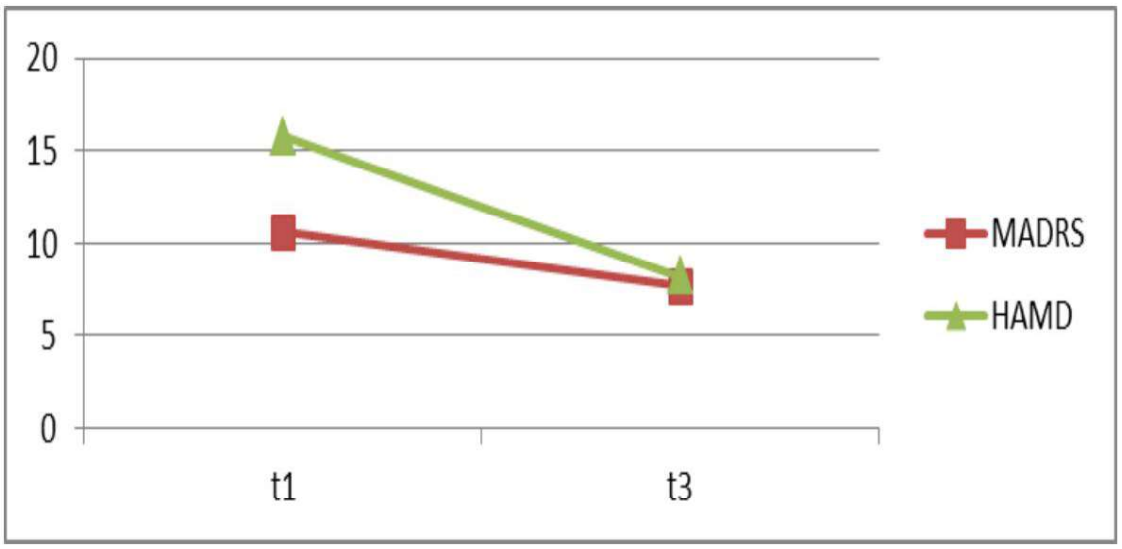


Figure 107. Graph showing the significant decrease in the depression scores HAMD and MADRS over the course of the test (T1 to T3) in the study "Urban spaces for a healthy age".
Source: LVR (2014)

Further results on the analysis of the HAMD and MADRS depression trajectories will follow in subsequent publications228.

Results on the course of affect

Furthermore, it is analyzed to what extent the level of affect before and after the tour changed. Two analyses were carried out:

- Analysis 1 (affect_day-related) takes into account all rounds before and after the Tour is equivalent on a daily basis.

- Analysis 2 (affect_person-related) looks at the person-related tours and determines the median of all affect values per test person. In this way, a more precise analysis can be carried out to examine a change in affect.

For both analyses, the Wilcoxon (Matched Pairs) test is used, since both cases it is a comparison of ordinal scaled data before and after the tour and thus they are to be considered dependent. [229]

[228] LVR (2014).
[229] To calculate this non-parametric test, the rank information of affect was previously changed from 0 = negative, 1 = positive, 3 = neither, recoded into 1 = negative, 2 = neither, 3 = positive.

Day-related affect

The Wilcoxon test provides for all 4 subscales of daily affect, *tension, calm, Stability and euphoria,* a significant change before and after the tour. This is followed by the Representation of the descriptive statistics in Figure 108 and the significances within Test statistics in Figure 109.

subscales of affect	N	mean	standard deviation
Affect before walking: tension	2511	2.60	0.647
Affect before walking: calm	2470	2.63	0.641
Affect before walking: stability	2414	2.61	0.635
Pre-course affect: euphoria	2293	2.42	0.666
Affect after course: tension	2494	2.69	0.584
Affect after gait: calm	2459	2.69	0.589
Affect after gait: stability	2441	2.72	0.554
Affect after course: Euphoria	2353	2.60	0.593

Figure 108. Descriptive statistics on the 4 subscales of the daily affect "tension, calm, stability and euphoria" before and after the dementia garden tour as part of the study "Urban Spaces for a healthy old age".
Source: Teimann

subscales of affect	Z	Exact signature (2-sided)
Affect after course: tension - Affect before walking: tension	-7,913	p < 0.001
Affect after gait: calm – Affect before walking: calm	-5.306	p < 0.001
Affect after gait: stability - Affect before walking: stability	-9.644	p < 0.001
Affect after course: Euphoria - Pre-course affect: euphoria	-14,038	p < 0.001

Figure 109. Test statistics for the four subscales of daily affect "tension, calm, stability and euphoria" before and after the dementia garden tour as part of the study "Urban spaces for a healthy age".

Personal affect

When analyzing the mean data per person, the significance analysis becomes more precise. Wilcoxon (Matched Pairs) test shows a significant improvement in the personal Sub-affect *tension, stability* and *euphoria* after the tour, but not in the case the sub-affect *rest* (see Figure 110 and Figure 111).

subscales of affect	N	mean	standard deviation
Affect before walking: tension	58	2.7241	0.47915
Affect before walking: calm	58	2.7672	0.49750
Affect before walking: stability	58	2.7241	0.46990
Pre-course affect: euphoria	58	2.3966	0.53606
Affect after course: tension	58	2.8448	0.35302
Affect after gait: calm	58	2.8190	0.37109
Affect after gait: stability	58	2.8793	0.32861
Affect after course: Euphoria	58	2.6379	0.49376

Figure 110. Descriptive statistics on the four subscales of personal affect "tension, calm, stability and euphoria" before and after the dementia garden tour as part of the study "Urban spaces for a healthy age".

Source: Teimann

subscales of affect	Z	Exact signature (2-sided)
Affect after course: tension – Affect before walking: tension	-2.294	P = 0.028
Affect after gait: calm – Affect before walking: calm	-1.104	P = 0.351
Affect after gait: stability – Affect before walking: stability	-3.035	P = 0.001
Affect after course: Euphoria – Pre-course affect: euphoria	-3.704	P < 0.001

Figure 111. Test statistics for the 4 subscales of the personal affect "tension, calm, stability and euphoria" before and after the dementia garden tour as part of the study "Urban spaces for a healthy age".

Source: Teimann

Conclusion

The hypotheses H1.1 – H1.2 on the mood of those affected / depression can be verified.

The **hypothesis H1.1** "Staying in dementia-friendly open spaces leads to an improvement in Depression among residents with dementia in the neighbourhood" has been confirmed, as a significant decrease in Depression scores HAMD and MADRS over T1-T3 are present (HAMD: $p = 0.017$ and MADRS: $p = 0.026$).

The **hypothesis H1.2** "Staying in dementia-friendly open spaces has a positive influence on Affect among residents with dementia in the neighbourhood" is proven, since with regard to day-related affect in all Subscales are significant (subscales: $p < 0.001$) and with regard to personal affect in the subscales *tension, stability and euphoria* (tension: $p = 0.028$, stability: $p = 0.001$ and euphoria $p < 0.001$).

8.2 Results on physical and social boundary conditions

HYPOTHESES

- **H2.1:** A short distance from the home to the dementia garden increases the duration of use.
- **H2.2:** The level of air temperature has an influence on the service life.
- **H2.3:** The level of relative humidity has an influence on the service life.
- **H2.4:** Social activities in the dementia garden increase the duration of use.

EE: Urban Planning

Application Mode Questionnaire (Appendix 3)

Daily protocols collected by study staff

Intervention measure: Dementia garden use

Focus: Service life

Measurement parameters: Dementia garden use (hours), distance to living area (m), social services (frequency, yes/no), air temperature (°C) and average relative humidity (%)

Sample size: N = 2933

Measurement times: daily

Analysis: Quantitative

sample description

From the total sample of 61 subjects, the information from 58 subjects (N = 58) was
The gender ratio was 14 male test subjects to 42 female
test subjects, although in 2 cases no information was available. The minimum age was 55
years and the maximum at 100. Here too, the age was not given in 2 cases.

General results on the duration of dementia garden use

The evaluation showed that the subjects had a total of 2933
have completed documented tours in the dementia garden. The minimum number of
The number of rounds per subject was 5 rounds and the maximum number was 99 rounds.
The total number of hours of use was 2723 (N = 58). The lowest number of
Number of hours a subject spent in the dementia garden was 2 hours and the highest
Number of hours 112. The average usage time per tour in hours was 0.9 (54
minutes), minimum 0.4 (24 minutes) and maximum 1.4 (84 minutes). This represents
Figure 112 shows this.

	sum of usage time in hours	Middle service life per tour in Hours	sum of useful life in minutes	Middle service life per tour in minutes
mean	46.94	0.8916	2816.48	53.4988
standard deviation	30,157	0.16534	1809.425	9.92046
minimum	2	0.40	120	24.00
maximum	112	1.40	6691	83.85
sum	2723	51.72	163356	3102.93

Figure 112. The duration of use of the dementia garden as part of the study "Urban spaces for healthy ageing".

Source: Teimann

For this purpose, the following sub-parameters are examined: The average service life and relative
Frequency in %, a user ranking and the average usage time in relation to
dementia groups

Average usage time and relative frequency in %

It is interesting to consider the average usage time in hours and its relative
Frequency in %. This allows you to determine the average usage time in the
Total usage per tour occurred most frequently. This is the
Hour class 0.81 to 0.91 and the *hour class 0.71 to 0.80* (see Figures 113 and 114).
These occur at 24.1% and 22.4% respectively - based on the total classes. This means that the

Compared to the other classes, subjects were most frequently between 43 to 48 minutes and second most frequently between 49 to 54 minutes per tour of the garden stopped.

class of lessons	frequency	Valid Percent	Cumulative percentages
,31 - ,40	1	1.7	1.7
,41 - ,50	0	0.0	0.0
,51 - ,60	0	0.0	0.0
,61 - ,70	4	6.9	8.6
,71 - ,80	13	22.4	31.0
,81 - ,90	14	24.1	55.2
,91 - 1,00	10	17.2	72.4
1.01 - 1.10	11	19.0	91.4
1.11 - 1.20	4	6.9	98.3
1.31+	1	1.7	100.0

Figure 113. Classification of the average duration of use of the dementia garden (hours) per tour to the relative frequency in % in the context of the study "Urban spaces for a healthy age".
Source: Teimann

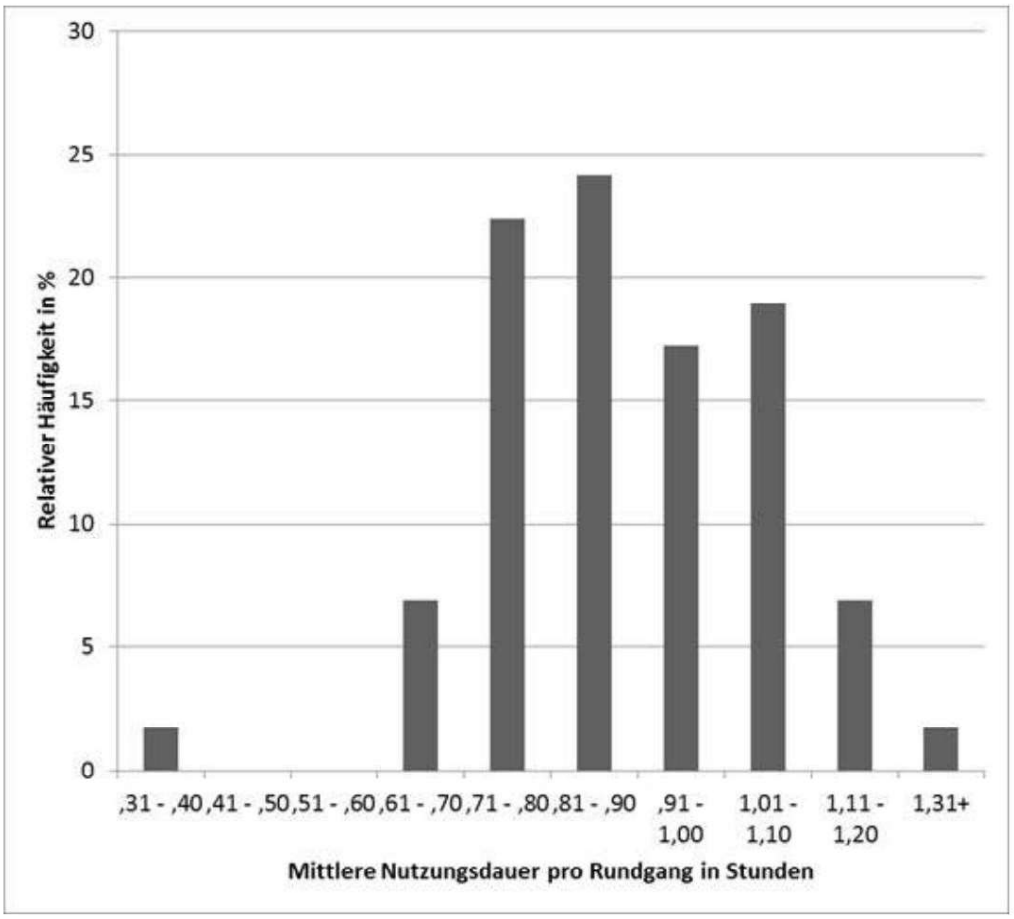


Figure 114. Graphic showing the average duration of use of the dementia garden (hours) and the relative frequency in % in the context of the study "Urban spaces for a healthy age".
Source: Teimann

user ranking

Based on the descriptive statistics (mean, *M* = 0.89 and standard deviation, *SD* = 0.16) was used in the sense of a user ranking a classification into minimal users, moderate Users and intensive users. 66% of all participants are in the value range (sum of usage time in hours) of M+/-1SD. These users can be considered as moderate All persons with a value less than M-1SD could therefore be considered Minimal users and all persons with values greater than M+1SD are considered intensive users. With This classification results in 7 minimal users, 41 moderate users and 10 Intensive users. What is interesting here is the average garden use within a Ranking group per user and week. On average, the minimum user per Week 24 minutes, the moderate user 1.4 hours and the intensive user 3.5 hours in Dementia Garden (testing period = 29 weeks).

user type according to number of hours of use		
minimal users	N	7
	mean	11.00
	standard deviation	4,760
	minimum	2
	maximum	16
	Total (hours of all minimal users in 29 weeks)	77
	Average per minimal user / week	0.4
moderate users	N	41
	mean	39.77
	standard deviation	15,800
	minimum	17
	maximum	65
	Total (hours of all moderate users in 29 weeks)	1630
	Average per moderate user / week	1.4
intensive users	N	10
	mean	101.52
	standard deviation	9,314
	minimum	78
	maximum	112
	Total (hours of all intensive users in 29 weeks)	1015
	Average per intensive user / week	3.5

Figure 115. User types according to hours of dementia garden use in the study “Urban spaces for healthy ageing”.

Source: Teimann

Average duration of use and dementia groups

In the initial description of the garden use, the average
service life of the entire sample (N = 58) (see Figure 112).
If allocation is made according to dementia groups (severity according to MMST value),
differentiated sub-parameters of the service life can be determined.

Based on the data in Figure 116, for the intervention period of 29 weeks
calculate that in mild dementia the weekly usage time is on average 1.8 hours
in moderate dementia it was also 1.8 hours and in severe dementia it was 1.3 hours.
Thus, people suffering from mild to moderate dementia use the
Dementia garden in the same number of hours. People with severe dementia use the
Dementia garden 28% less than people with mild and moderate dementia.

severity of dementia		sum of usage time in hours	Middle Usage time per tour in Hours	sum of usage time in minutes	Average usage time per tour in minutes
light	N	11	11	11	11
	mean	54.54	0.9048	3272.18	54.2872
	standard deviation	38,405	0.21715	2304,307	13.02929
	minimum	2	,40	120	24.00
	maximum	112	1.13	6691	67.59
	sum	600	9.95	35994	597.16
medium-difficult	N	21	21	21	21
	mean	51.63	0.8999	3097.86	53.9934
	standard deviation	31,357	0.13302	1881,395	7.98137
	minimum	15	,62	910	37.34
	maximum	105	1.07	6319	64.48
	sum	1084	18.90	65055	1133.86
difficult	N	13	13	13	13
	mean	38.27	0.8360	2295.92	50.1628
	standard deviation	27,389	0.15891	1643,353	9.53473
	minimum	8	0.63	480	37.94
	maximum	104	1.11	6240	66.38
	sum	497	10.87	29847	652.12

Figure 116. Dementia garden use in relation to the dementia severity groups in the study "Urban spaces for healthy ageing".
Source: Teimann

Results on distance to living space, social amenities, air temperature and humidity

Duration of use and distance of the living area to the dementia garden

In order to examine the influence of the distance from home on the duration of use,
The analysis included 2 models with different predictors. The calculation was carried out using linear regression. Model 1 indicates the distance between *house and garden* and model 2 Additionally, the *age in years at the start of the examination* and the *MMST score.*

Including the **average usage time in minutes as a dependent variable ,**
In both models, only the distance of the garden from the living area had a significant influence (Model 1: $p = 0.006$ and Model 2: $p = 0.015$). In Model 2, by additionally controlling for age and the MMST total score is considered, it is shown that the predictors *age* and *MMST score* no significant predictive power for the average duration of the tour (age: $p = 0.755$ and MMST: $p = 0.638$).

Model		B	Beta*	Sig.
1	distance house Garden	-0.047	-0.402	0.006
2	distance house Garden	-0.044	-0.378	0.015
	Age in years beginning of the Investigation	-0.044	-0.045	0.755
	MMST total	0.097	0.072	0.638

* Beta indicates how significant the effect is.
Beta > 0.10 = small, Beta > 0.30 = moderate and Beta > 0.50 = large

Figure 117. Relationship between the average usage time in minutes and the distance "house-garden" for 2 calculation models in the context of the study "Urban spaces for a healthy age".
Source: Teimann

If, however, **the dependent variable is the number of rounds** and not the mean
Looking at the duration of use, it can be seen that in Model 2 age has a significant influence on the number of rounds *($p = 0.033$)*, but not the MMST value *($p = 0.763$)*. The means that the older the demented person is, the fewer rounds were made. It should be noted that that the connection does not exist (as previously expected): The higher the degree of cognitive

The more impaired the patient is, the fewer the number of rounds. The frequency of rounds remained therefore unaffected by the severity of dementia.

Model		B	beta	Sig.
1	distance house Garden	-0.108	-0.315	0.035
2	distance house Garden	-0.099	-0.288	0.056
	Age in years beginning of the Investigation	-0.885	-0.311	0.033
	MMST total 0.179		0.045	0.763

Figure 118. Relationship between the number of rounds and the distance "house-garden" for 2 calculation models in the study "Urban spaces for a healthy age".
Source: Teimann

Average service life depending on the distance from the living area

The 7 living areas in which the test subjects lived were between 50 and 230 meters from the dementia garden. The residents of living areas I to IV had a distance of 50 meters, the residents of living area V 150 meters, from living area VI 210 meters and from living area VII 230 meters.

The question was by how many time units (min.) the average service life of the Dementia garden is reduced if the distance from the living area to the dementia garden is one distance measurement unit (m). Here the non-standardized coefficient B is Figure 117. The value *-0.044* means that with increasing distance, the average usage time decreases by 0.04 minutes per meter (2.4 s/m).

Average usage time in minutes, model 2	Unstandardized coefficient B	Sig. (p)
Distance *house-garden*	-0.044	*0.015*

From this it can be further calculated that in the spatial distance spectrum Between 50 and 230 meters from the living space, the average usage time is increasing way (see Figure 119).

The average service life per Tour is reduced by	in the distance of the living area to the Dementia Garden of
24 seconds	10 meters
2 minutes	50 meters
4 minutes	100 meters
6 minutes	150 meters
8.4 minutes	210 meters
9.2 minutes	230 meters

Figure 119. Reduction of the average duration of use per round trip in relation to the distance to living space in the context of the study "Urban spaces for a healthy age".
Source: Teimann

Average usage time and motivation

There is a significant, negative correlation with motivation *(rs* = -0.127, *p* < 0.001).
The less motivation people had to have, the longer they stayed in the garden.
The Spearman rank correlation coefficient is used because the motivation level before the Tour is described as 1 = *was easy to motivate,* 2 = *was difficult motivate* and 3 = *could not be motivated at all.* For this reason, the correlation is also negative, because the smaller the value for motivation, the longer or larger the value for the useful life.

		Duration min.
motivation for the tour	correlation coefficient	-0.127
	Sig. (2-sided)	p < 0.001
	N	2705

Figure 120. Relationship between motivation and duration of dementia garden use in the study "Urban spaces for healthy ageing".
Source: Teimann

Average usage time and weather data / social offers

During the test, the air temperature (°C) [230] in maximum at 32.6 (°C) and in Minimum at -9 (°C). For the daily average relative humidity, the maximum and Minimum value 98% or 39% (Appendix 6). The social services were provided throughout the Period predominantly once a week.

For the intervention room, the recorded rounds (N = 2933) were used to Relationships between service life/air temperature, service life/air humidity and Duration of use/use of social services was examined. All correlations are significant (Air temperature: $p < 0.001$, air humidity: $p = 0.032$ and social amenities: $p < 0.001$; see Annex 7).

In addition, the determined correlations were compared using z-tests to determine the extent to which the relationships between average usage time/weather data and average Duration of use/social offers differ from each other. The results are:

a) Air temperature $r = 0.12$ vs. air humidity $r = -0.04$; $z = 5.69$, $p < 0.001$
b) Air temperature $r = 0.12$ vs. social activity $r = 0.18$; $z = -2.03$, $p = 0.043$
c) Social activity $r = 0.18$ vs. humidity $r = -0.04$; $z = 7.36$, $p < 0.001$

All of the correlations listed are about the correlation with the duration of use. All differences between the correlations are significant; the effect sizes of the individual However, correlations are low. In terms of content, these results mean that the connection between social activity and usage time is significantly larger than the Relationship between weather data and usage time. In addition, the influence of Air temperature (°C) is significantly higher than the relative humidity (%). With increasing The service life increases with increasing air temperature, while it decreases minimally with increasing air humidity. sinks.

service life in relation to classified temperature ranges

On the question of whether the service life in a certain temperature range is longer than in another, the air temperature (°C) was divided into classes of 5 (°C) For these classes, the total usage time in hours could be displayed. For a more precise analysis, the dates of the social offers were excluded.

[230] Hourly values of air temperature at 2 m height at 11:00 UTC (Universal Time, Coordinated)

You can see that most of the tours took place between 10 - 25 (°C) and thus the total useful life is significantly greater.
In the temperature range 15.01 to 20.00 (°C) 658 hours of total use based on the sample (N = 58), between 20.01 and 25.00 (°C) 551 hours and between 10.01 and 15.00 (°C) 467 hours (see Annex 8).

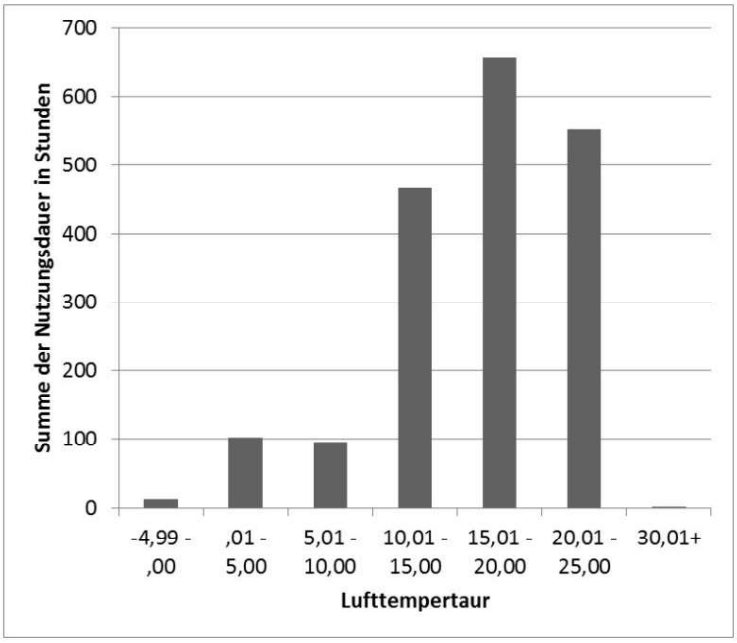


Figure 121. Class distribution of air temperature at 2 m height at 11:00 UTC in relation to the sum of the usage time (hours) in the study "Urban spaces for a healthy age".
Source: Teimann

duration of use in relation to the use of social services

If we analyse the usage time using social services, it becomes clear that without the offer of a social activity, the dementia garden can be used for up to 55 minutes Tours lasting longer than 55 minutes are always accompanied by a social offer tied together.

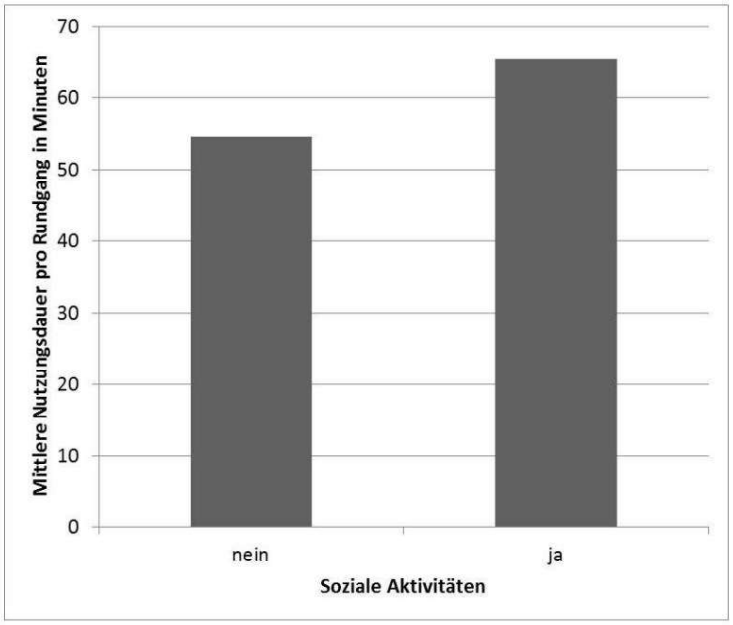


Figure 122. Average usage time per tour (min.) in relation to existing or non-existing social activities as part of the study "Urban Spaces for Healthy Aging".
Source: Teimann

Conclusion

The hypotheses, H2.1 - H2.4 on physical and social boundary conditions could be verified.

The hypothesis **H2.1** "A short distance to the dementia garden increases the duration of use" could
In addition, it can be said that age has an influence on the number of rounds
whereas the degree of dementia has no influence on the number of rounds.

Regarding hypotheses **H2.2 and H2.3** "The level of air temperature has an influence on the
service life" and "the level of relative humidity has an influence on the service life"
could be verified with significant correlation values at low effect sizes of the correlations
become.

In the confirmation analysis of **H2.4** "Social offers in the dementia garden increase the duration of use"
It was found that the use of social services compared to air temperature and
to humidity has the stronger influence on the service life.

8.3 Results for the review and application of 3D cognitive mapping

HYPOTHESES

- **H3.1:** The memory performance regarding the spatial objects in 3D cognitive mapping shows a connection with the degree of cognitive decline.
- **H3.2:** Memory performance in 3D mapping differs with respect to individual objects.

FE: Urban Planning

3-D cognitive mapping; proactive game with oral tasks (Appendix 4)

Intervention measure: Dementia garden use

Focus: memory performance regarding various spatial objects

Measurement parameter: memory hits per room object

Sample size: N = 29

Measurement times: once after T3

Analysis: Quantitative

sample description

Of the 29 test subjects, 9 were in the stage of mild dementia, 15 in the stage of moderate dementia and 5 in the stage of severe dementia. Of 6 test subjects, the information. The MMST value in this sample lies between the minimum value 2 and the maximum value of 26.

Results on the relationship between memory performance regarding spatial objects and cognitive decline

The qualitative analysis results in the absolute hits of the respective spatial objects related to all test subjects as follows:

- Lawn bench: 38
- Stone blocks: 36
- Pavilion: 30
- Wells: 24 and
- Robinia posts: 15.

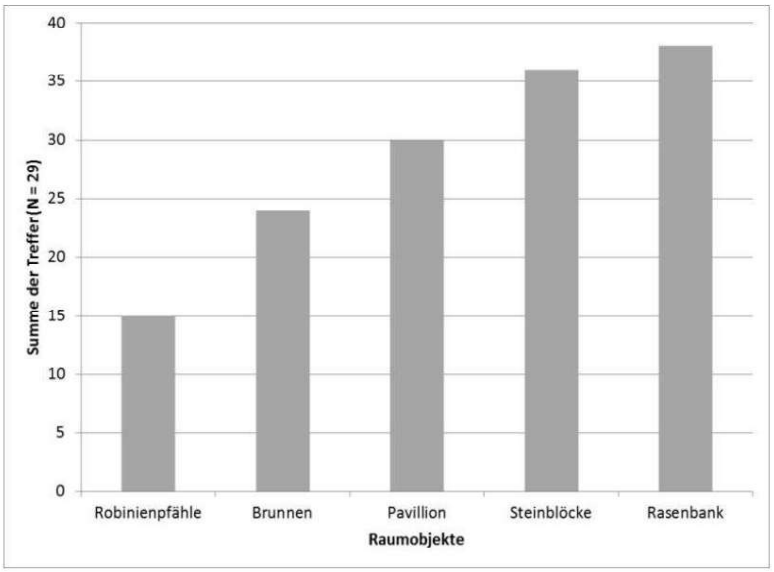


Figure 123. Frequency of absolute hits in total (N=29) related to the spatial objects of the dementia garden in the context of the study "Urban spaces for a healthy age".
Source: Teimann

The further data analysis, to what extent the hit numbers regarding the

The distribution of spatial objects across the three levels of dementia severity can be seen in Appendix 9.

To verify hypothesis H3.1, whether there is a relationship between the

Memory performance regarding spatial objects in 3D cognitive mapping and the degree of

cognitive decay and the hypothesis H3.2, whether memory performance in 3-D

To differentiate cognitive mapping with respect to individual objects, a test procedure was developed for

Determination of the Pearson correlation per spatial object is applied (see Figure 124).

		MMST value
Pavillion - Total hits	Pearson correlation	0.400
	Sig. (2-sided)	0.032
Brunnen - Total hits	Pearson correlation	0.323
	Sig. (2-sided)	0.087
Stone blocks - total hits	Pearson correlation	0.237
	Sig. (2-sided)	0.215
Robinia posts - hits in total	Pearson correlation	0.239
	Sig. (2-sided)	0.212
Rasenbank - Total hits	Pearson correlation	0.544
	Sig. (2-sided)	0.002

Figure 124. Relationship between memory performance regarding spatial objects in the dementia garden and the severity of dementia (MMST score) in the study "Urban spaces for healthy aging".
Source: Teimann

This shows that there is a significant correlation between memory performance and MMST value for 2 of 5 spatial objects Pavilion *(p* = 0.032) and Lawn Bench *(p* = 0.002) This means that whether a person remembers these objects depends on the severity of dementia. If the MMST value drops (= worsening of dementia), the Memory performance. For the other spatial objects, no significant correlation between the memory performance and the MMST values.
This results in two groups of spatial objects with different levels of memorability. Group 1 (lawn bench and pavilion) includes objects that, depending on the Cognition in dementia and the objects of group 2 (stone blocks, Robinia posts and wells) are examined by the subjects in three-dimensional Environmental context without the severity of dementia having a significant influence. Since a relatively small number of test participants were used for testing, were used and the number of item hits is at a low level, it is advisable to further investigate this representative applicability of the test investigate.

Conclusion

The hypotheses, H3.1 – H3.2 for the testing and application of the 3-D Cognitive Mappings were confirmed.

The quantitative analysis confirmed the hypothesis H3.1 “The memory performance regarding the Spatial objects in 3D cognitive mapping show a correlation with the degree of cognitive decay.” and the hypothesis H3.2 “Memory performance in 3-D mapping regarding individual objects differ.”

The test procedure makes it possible to distinguish between operational objects and less operational objects (memorability of spatial objects).

8.4 Results on family satisfaction

HYPOTHESES

• **H4:** Dementia-friendly outdoor facilities increase family satisfaction.

FE: Geriatrics

Questionnaire on the Effectiveness *of Dementia Gardens in the Neighborhood* (Appendix 5)

Written postal survey with scaled response options, questionnaire: *effectiveness*

Intervention measure: Dementia garden use

Focus: Family Satisfaction

Measurement parameters: Parameters for the effectiveness of the *dementia garden* in the neighbourhood measure

Sample size: N = 35

Measurement times: after T3

Analysis: Qualitative

Results on the effectiveness of the *dementia garden* measure **in the neighbourhood**

The descriptive data analysis revealed 3 clear trends in the family members' assessment of Effectiveness of the dementia garden measure in the neighbourhood.

1. The relatives saw the construction of the Demengarten as a clear Village enrichment. The high level of evaluation participation of those contacted with a The response rate of 60.2% also indicated this result. With similar A rate of 20% is usual for information collection. 80% of the respondents could agree with the statement *fully* agree that the dementia garden is an asset to the village and 20% could *rather* agree with her. What is striking about this question is that no information from the negative consent or the statement *neither nor* (= ie neither I *agree* nor I *disagree)* were made.

2. Another clear descriptive trend emerged in the assessment of the Plant as a therapeutic offer. In 69% of the total responses this statement was *completely* and 31% considered it to be *rather* accurate. Here too, the rating exclusively in the area of positive agreement. This is to be regarded as an important result, especially for the importance of using garden therapy within the non-drug treatment of dementia.

3. In the aspect to be assessed whether the dementia patient benefits from the dementia garden measure around 48.6% of respondents agreed *completely* and around 22.9% *rather* 20% said *neither* and 2.9% *rather disagreed* . The subjective view of the Relatives thus showed that almost every second study participant had General condition has improved according to the subjective assessment of relatives.

In addition, it has been shown that the shared use of the garden by the resident with dementia and his family member was perceived to a moderate degree. This aspect gained 40% *fully* agreed and 31.4% *tended to* agree.

The fact that family participation in milieu therapeutic measures or social services and the stated intentions to visit were comparatively low, this could be explained It should be noted that some of the survey participants were legal guardians. Further details of the evaluation can be found in Appendix 10.

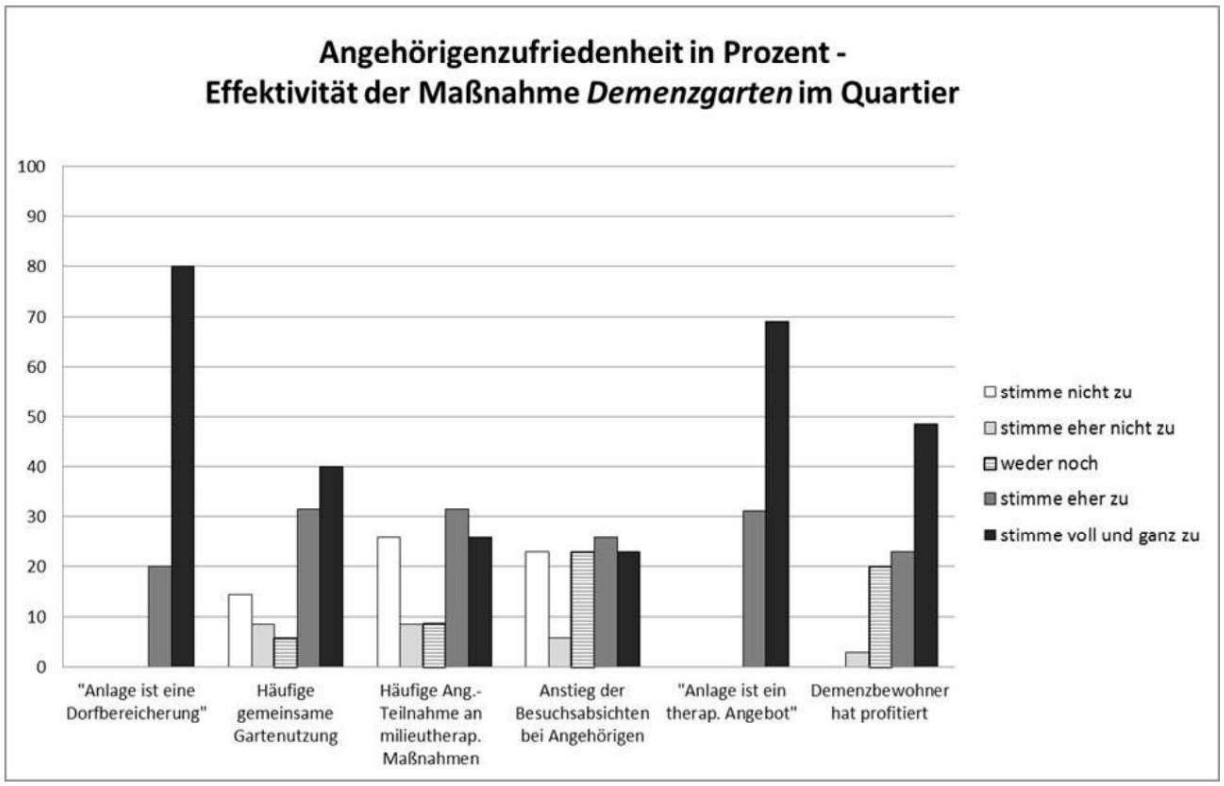


Figure 125. Relatives' satisfaction with the dementia garden measure in the neighbourhood as part of the study "Urban spaces for a healthy age".
Source: LVR (2014)

Conclusion

Hypothesis **H4** regarding family member satisfaction is confirmed.

“Dementia-friendly outdoor facilities increase family satisfaction.” could be tested as hypothesis **H4**
The measurement parameters were collected using a written postal survey.
The data were evaluated descriptively and thus analyzed qualitatively.

The 3 clear tendencies as the basis for hypothesis verification are:

1. 80% of the relatives - with *full* agreement - saw the dementia garden as a village enrichment.

2. With a percentage of 69% - in the approval scale *completely* - the relatives considered the dementia garden as a therapeutic offering.

3. For almost every second study participant, the overall feeling according to subjective assessment of relatives improved.

9 Summary

In the study *Urban Spaces for a Healthy Age* (UDE), a prototype of the functional-therapeutic open space concept was evaluated for its medical effectiveness. A specially developed for the *Village – Living in Old Age* of the Theodor Fliedner Foundation, Mülheim adR
The open-air system of 1300 m² was used for 6 months on a total sample of 61 test persons and the changes in the measured values were documented over the period (T1 - before the start of the measure, T2 - after 3 months and T3 - after 6 months). The results can be used as guidelines and orientation aids for planning practice and within elderly care management (see Figure 126).

Results of the study *Urban Spaces for a Healthy Age* **- Guidelines for dementia-friendly open space planning in the neighbourhood**			
measurement parameters	**samples -size**	**measuring time-point**	**Result**
mood of those affected / depression			
HAMD value* MADRS score*	N = 54 N = 50	T1-T3	Significant decrease in depression scores HAMD and MADRS (HAMD: $p = 0.017$ and MADRS: $p = 0.026$).
Affective measurement (before and after garden tour)	N = 58	daily	Positive influence on the affect of residents with dementia in the neighborhood. With regard to day-related affect, there was a significant improvement in all subscales after the garden tour (all subscales: $p < 0.01$) and with regard to personal affect in the subscales tension, stability and euphoria (tension: p = 0.028; stability: $p = 0.001$; euphoria $p < 0.001$).
Physical and social conditions			
General useful life of the dementia garden	N = 2933	daily	• Minimum number of rounds/subject = 5. • Maximum number of rounds/subject = 99. • Minimum usage time per subject = 2 hours. • Maximum usage time/subject = 122 hours. • The average usage time per tour in hours was 0.9 (54 minutes), with a minimum of 0.4 (24 minutes) and a maximum of 1.4 (84 minutes). • The most frequently represented time intervals of the average usage time are 1. the hour class 0.81 to 0.91 and 2. the hour class 0.71 to 0.80. These occur in 24.1% and 22.4% of the total class hours respectively. • On average, the minimum user stays 24 Minutes, the moderate user 1.4 hours and the intensive user 3.5 hours per week in the dementia garden.

Special useful life of the dementia garden	N = 2933	daily	• In mild dementia, the average usage time per week is 1.8 hours, in moderate dementia it is also 1.8 hours and in severe dementia it is 1.3 hours. • The average usage time per tour in Hours is 0.9 hours for mild and moderate dementia and 0.8 hours for severe dementia.
living space distance	N = 2933	daily	• With increasing distance from living space, the average usage time decreases by 0.04 minutes per meter (2.4 s/m), i.e. for example, for living areas 50 meters away by 2 minutes and for 230 meters distant living areas by 9.2 minutes. The analysis also shows that no prediction of the duration of use can be made based on age and the severity of dementia. • When looking at the number of rounds, the correlation with age is significant. This means that the older the person, the fewer rounds are made. The frequency of rounds, on the other hand, remains unaffected by the severity of the dementia.
Air temperature in °C Relative air humidity in %	N = 2933	daily	• Between 10 - 25 (°C) most of the Tours took place. With a scaling subdivision of 5 °C each, the corresponding ranking of the preferred temperature ranges was: 1. from 15.01 to 20.00 (°C), 2. from 20.01 to 25.00 (°C) and 3. from 10.01 to 15.00 (°C). • There is a slight influence of humidity on the service life. As humidity increases, the average service life decreases.
Social Services N = 2933		daily	• The use of social services has a greater influence on the duration of use compared to the weather influence. • Without the offer of a social activity, the dementia garden can be used for up to 55 minutes. • Tours that last longer than 55 minutes are always linked to a social offer.

REVIEW AND APPLICATION OF 3D COGNITIVE MAPPING			
Memory hits per room object in a pro-active Game with verbally posed tasks	N = 29	after T3	• 3D cognitive mapping is sensitive to capturing the different memory values of spatial objects. • The memory performance of the test subjects regarding the spatial objects is related to the degree of cognitive decline. • There are 2 groups of spatial objects with different memory values. Group 1 (lawn bench and pavilion) contains spatial objects that are dependent on cognitive ability in dementia. If spatial objects of group 2 (stone blocks, robinia posts and fountains) are subjects, then without a significant association with dementia severity.
RELATIVE SATISFACTION			
parameter *effectiveness of measure* *Dementia garden in neighborhood**	N = 35	after T3	• 80% of the relatives see (with the Approval scale *completely)* in the dementia garden is an enrichment of the village. • 69% of relatives consider the dementia garden *(completely)* as a therapeutic offering. • The subjective assessment of the relatives showed that after using the dementia garden, almost every second study participant Overall feeling has improved thanks to the dementia garden.

*Figure 126. Results of the study "Urban spaces for a healthy age". Guidelines for dementia-friendly open space planning in the district; *LVR (2014).*
Source: Teimann

Based on the results, the following hypotheses were verified:

MOOD OF THE AFFECTED / DEPRESSIVE

- H1.1: Spending time in dementia-friendly open spaces leads to an improvement in depression in residents with dementia in the neighborhood.
- H1.2: Spending time in dementia-friendly open spaces has a positive influence on the affect of residents with dementia in the neighborhood.

PHYSICAL AND SOCIAL CONDITIONS

- H2.1: A short distance from the home to the dementia garden increases the duration of use.
- H2.2: The level of air temperature has an influence on the service life.
- H2.3: The level of humidity has an influence on the service life.
- H2.4: Social activities in the dementia garden increase the duration of use.

REVIEW AND APPLICATION OF 3D COGNITIVE MAPPING

- H3.1: The memory performance regarding the spatial objects in 3D cognitive mapping shows a connection with the degree of cognitive decline.
- H3.2: Memory performance in 3D cognitive mapping differs with respect to individual objects.

RELATIVE SATISFACTION

- H4: Dementia-friendly outdoor facilities increase family satisfaction.

10 Conclusion

The study *Urban Spaces for Healthy Ageing* (UDE) was an architectural effectiveness review, with the question of whether the use of built space has a medical and psycho-social effect on health in old age.

can be achieved. The planning approach is to use open space as a public space and a resource available at the interface between urban development and geriatric care systems for therapeutic purposes. This dissertation contains empirical evidence that applied dementia-friendly open space concepts have a significant influence on the psychological status of the individual in the neighborhood. In the 1980s, there were new concepts for care facilities in the construction industry that turned away from the usual institutional care and established new structural structures for a more innovative living and care environment. This included the Theodor Fliedner Foundation

as a test site.

In the 1990s, the concept of barrier-free construction entered German planning practice.
He stood for structural guidelines that help to accommodate people with mobility and sensory impairments
To make it easier for people to access public spaces and buildings. These two developments were primarily focused on social planning and the immediate freedom of movement of residents.

In previous planning for cities, public open spaces and green areas, demographics and the severity of dementia have not been taken into account. Medicine has not yet turned to this field of research and planners and architects have not yet had sufficient knowledge from neurology and nursing science for this type of urban space research.

The next step would be the further development of planning principles for the construction industry, which demonstrably include functional-therapeutic construction measures and elements, as well as empirical evidence that rooms or open spaces have a medical effect on the health status of patients or residents of the district.

In this dissertation, it was possible to provide empirical evidence for this in the case of dementia.

Typology of open spaces for dementia and Alzheimer's dementia

As a basis for the empirical study of the open space concept I developed (a prototype), I have typologized existing open spaces for dementia and Alzheimer's dementia for the first time and in relation to their use during the course of dementia. There were 6 dementia gardens that were built 7-10 years ago in North Rhine-Westphalia.

The criteria used were the level of decision-making and orientation that the garden user faces and has to master during the tour.[231] This is
a necessary consideration for the development of a functional and large-scale dementia-friendly open space in the neighbourhood that is accessible to people with dementia.

[231] Teimann (2012).

Urban Planning Assessment of Nursing Home Complexes and Neighborhoods

The dissertation is the first to set up an urban planning evaluation scheme with which nursing home complexes and districts are assessed in terms of their spatial friendliness for the elderly and dementia in three stages. This overview, intended as *a checklist* in senior-friendly planning, goes beyond *accessibility* and evaluates in detail

and practical fixed and flexible construction measures for public space.232 This evaluation scheme was also used to assess the dementia friendliness of the *village – living in old age*
investigated and discussed in this dissertation.

Empirical study

The main component of the scientific work is the medical evaluation of a functional-therapeutic open space concept. The question being investigated is whether the use of open space has an effect on the clinical picture of dementia.

Neuropsychiatric Diagnostics of Geriatrics

In the present test setting and after a defined test procedure, a significant improvement in depression scores was determined based on the evaluation of psychometric scales. Quantitative analyses showed significance for a reduction in the measurement parameters HAMD and MADRS over the test period of 6 months and for the improvement in affect (subscales: *tension, stability* and *euphoria)* after each open space tour compared to the affect state before each tour. To what extent the

It has not yet been proven whether intervention within a long-term study can have an impact on medication for dementia.

Urban Planning District Analyses

** Physical and social boundary conditions*

The specially developed for the test site *Das Dorf - Wohnen im Alter* (64 000 m²), TFS,
The dementia-friendly open space (1300 m²) was used by residents with dementia for an average of 55 minutes per visit. They did this with or without an escort.

If the specific usage time is considered, people with mild and moderate dementia used the open space on average 1.8 hours per week and people with severe dementia used the open space 1.3 hours per week. In Chapter 3.3. *Potential of the space for dementia*
It is described that people with mild to moderate dementia can still have sufficient spatial orientation. This result regarding the specific duration of use could indicate that, if orientation is still present, those affected are relatively willing to visit distant destinations. There are no comparative values from other empirical studies on the measurement parameter *duration of use.*

From the perspective of geriatric nursing practice, these results can be interpreted as a high intensity of use, since the daily visit to the open space was voluntary.

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[232] See Chapter 5.5, *The Fliedner Village and its Urban Development,* Figure 61.

The following guideline value was determined for planning practice within local mobility. As the distance from the living area increases, the average usage time decreases by 0.04 minutes per meter (2.4 s/m). This value was obtained for the range of distance from the living area from 0 to 230 meters. This means, for example, a reduction of 9.2 minutes in the tour time if the living area is 230 meters from the open space (with an average usage time of 55 minutes). In order to be able to make predictions for a larger catchment area, further studies would have to follow.

Furthermore, the following statement applies: Age has no significant influence on the length of time the open space is used, but it does have an influence on the number of walks. It is noteworthy that the frequency of walks remains unaffected by the severity of dementia. This means that dementia does not predict the frequency of walks and it suggests that, in a dementia-friendly living environment, the person with dementia actively visits the open space for physical and social activity if they need it.

The weather conditions (air temperature and humidity) have an influence on the duration of use. For the walks in the open area, the preferred temperature ranges were 1. 15.01 to 20.00 (°C), 2. 20.01 to 25.00 (°C) and 3. 10.01 to 15.00 (°C).
It was to be expected that the average duration of use would decrease with increasing humidity. The influence of humidity was small here. However, if the influence of social activities on the duration of use is analyzed, their effect on the duration of use is considered to be comparatively greater. Without the offer of a social activity, the open space is used for up to 55 minutes. Tours that last longer than 55 minutes are always linked to a social activity. The intensity of the use of the outdoor space could therefore be regulated by using social activities.

**** Review and application of 3D cognitive mapping***

So far, no method has been used to create spatial objects for open space design
that have proven to have memorable value for people with dementia.
If this were available, open space planning could draw on a pool of dementia-friendly and validated modules. Previous qualitative planning recommendations for dementia gardens indicated the advantages of special path systems for orientation and walking safety in the space. The necessary visibility of open spaces is also described in this context. In Chapter 3, Space *& Dementia & Health,*

reference is made to the empirical studies that analyse the sensory perception ability in dementia in space. The number of these studies is small.

The 3D cognitive mapping233 newly developed for the study is sensitive to the recording of the different memory values of spatial objects. The data analysis showed that the memory performance of the test subjects with regard to the spatial objects is related to the degree of cognitive decline. Thus, there were 2 groups of spatial objects: Group 1 contains spatial objects that are dependent on the cognitive ability in dementia. If spatial objects from group 2 are remembered by the test subject, then there is no significant connection with his dementia.

---

[233] See Chapter 7, *Interdisciplinary Analysis and Data Evaluation,* 3. Method.

Severity. For planning practice, this would mean that (compared to all spatial objects examined) the spatial objects from group 1 can be used more effectively for more orientation in the room in the phase of mild to moderate dementia and that the use of the spatial objects from group 2 as a general means of orientation in the room can be dispensed with.

**** Checking family satisfaction***

The final family survey should be viewed as a neighborhood evaluation. In addition, these results, together with the findings of neuropsychiatric diagnostics, could suggest that the use of functional therapeutic open-space applications within inpatient and outpatient care as part of non-pharmacological dementia treatment is justified.

In summary, the family survey yielded the following results:

1. 80% of relatives see the dementia garden as an enrichment for the village.
2. 69% of relatives consider the dementia garden to be a therapeutic offering.
3. The subjective assessment of the relatives showed that after using the dementia garden, almost every second study participant
   Overall feeling has improved thanks to the dementia garden.

Establishment of a demographically stable *urban space management*

Public space as built-up open space has not yet been given any importance for the

Health and care sector. A coordinated cooperation between the construction sector and the health sector must now be established. The aim is to make it possible for cities and municipalities to implement best practice examples such as the *Urban Spaces for Healthy Ageing* model . See Figure 127.

Open space planning is able

ÿ a functional-therapeutic network of spaces, paths and areas between the district care provide stations,
ÿ To create open spaces that have an antidepressant effect,
ÿ To absorb *the burden of care* in outpatient care structures,
ÿ to support in pre-care,
ÿ to enable the realization of mobility and freedom needs (violence prevention),
ÿ the specialist staff of nursing and outpatient dementia care with the additional To strengthen the provision of outdoor therapy rooms and
ÿ to improve the social climate in neighborhoods and districts.

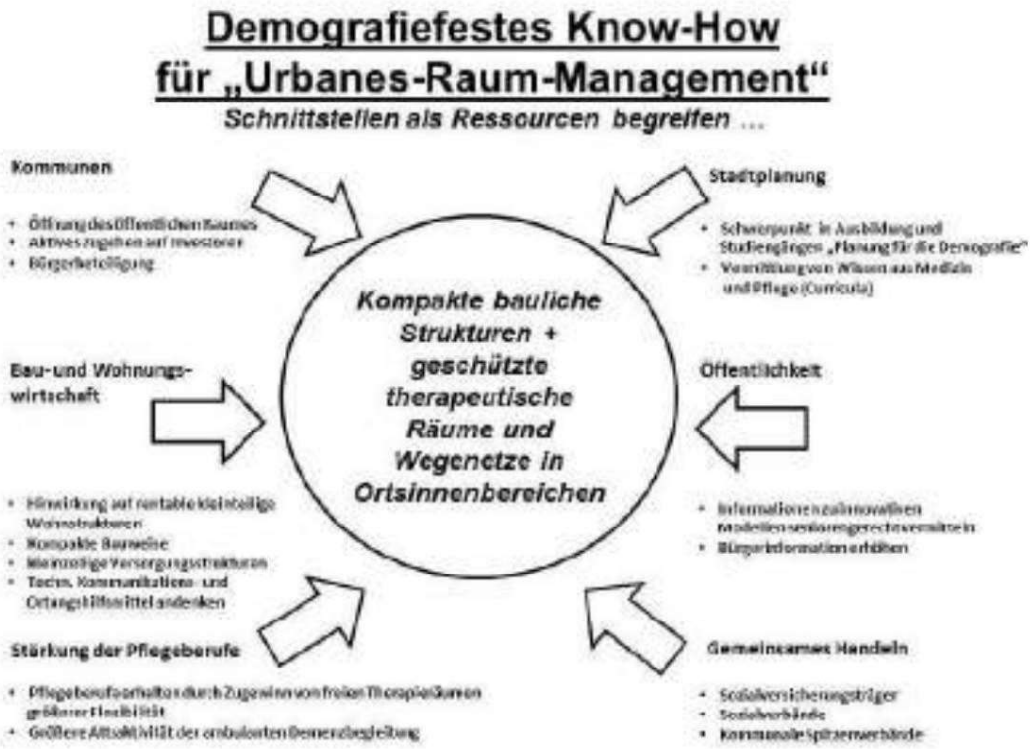

Figure 127. Demographically sound know-how for “urban space management”. Understanding interfaces as resources.
Source: Teimann

I would like to conclude my dissertation on the model project *Urban Spaces for a Healthy Age* with the votes from the group of people who were the test residents during the accompanied throughout the course of the study.[234]

“As a legal guardian of people with dementia, I can only support the existence of such an offer.”

“People with dementia need long-term support and spending time in the garden can be considered a good remedy.”

"I never imagined the positive effects of my brother's regular visits as part of the project would be possible. I am very pleased about it."

"A really great project."

“My mother always enjoyed using the facility in dry weather.”

"My mother in particular is very open to sensory perceptions. She used to enjoy working in the garden."

"The project has helped to improve the quality of life in the *village - living in old age* . When can we expect the study results to be published?"

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APPENDIX 1 – Survey instrument – Depression score *HAMD*

Psychometrische Skalen - Depressionen im Alter

HAMD

Name, Vorname	Datum, Uhrzeit
Rater	Score

Anleitung: Bitte jeweils nur die zutreffende Ziffer ankreuzen! Bitte alle Feststellungen beantworten!

1. Depressive Stimmung (Gefühl der Traurigkeit, Hoffnungslosigkeit, Hilflosigkeit, Wertlosigkeit)

Keine	0
Nur auf Befragen geäußert	1
Vom Patienten spontan geäußert	2
Aus dem Verhalten zu erkennen (z.B. Gesichtsausdruck, Körperhaltung, Stimme, Neigung zum Weinen	3
Patient drückt FAST AUSSCHLIESSLICH diese Gefühlszustände in seiner verbalen und nicht verbalen Kommunikation aus	4

2. Schuldgefühle

Keine	0
Selbstvorwürfe, glaubt Mitmenschen enttäuscht zu haben	1
Schuldgefühle oder Grübeln über frühere Fehler und „Sünden"	2
Jetzige Krankheit wird als Strafe gewertet, Versündigungswahn	3
Anklagende oder bedrohende akustische oder optische Halluzination	4

3. Suizid

Keiner	0
Lebensüberdruss	1
Todeswunsch, denkt an den eigenen Tod	2
Suizidgedanken oder entsprechendes Verhalten	3
Suizidversuch (jeder ernste Versuch = 4)	4

4. Einschlafstörung

Keine	0
Gelegentliche Einschlafstörung (mehr als ½ Stunde)	1
Regelmäßige Einschlafstörung	2

5. Durchschlafstörungen

Keine	0
Patient klagt über unruhigen oder gestörten Schlaf	1
Nächtliches Aufwachen bzw. Aufstehen (falls nicht nur zur Harn- oder Stuhlentleerung)	2

6. Arbeit und sonstige Tätigkeiten

Keine Beeinträchtigung	0
Hält sich für leistungsfähig, erschöpft oder schlapp bei seinen Tätigkeiten (Arbeit oder Hobbys) oder fühlt sich entsprechend.	1
Verlust des Interesses an seinen Tätigkeiten (Arbeit oder Hobbys), muß sich dazu zwingen. Sagt das selbst oder läßt es durch Lustlosigkeit, Entscheidungslosigkeit und sprunghafte Entschlußänderungen erkennen.	2
Wendet weniger Zeit für seine Tätigkeiten auf oder leistet weniger. Bei stationärer Behandlung Ziffer 3 ankreuzen, wenn der Patient weniger als 3 Stunden an Tätigkeiten teilnimmt. Ausgenommen Hausarbeiten auf der Station.	3
Hat wegen der jetzigen Krankheit mit der Arbeit aufgehört. Bei stationärer Behandlung ist Ziffer 4 anzukreuzen, falls Patient an keinen Tätigkeiten teilnimmt, mit Ausnahme der Hausarbeiten auf der Station oder wenn der Patient die Hausarbeit nur unter Mithilfe leisten kann.	4

7. Depressive Hemmungen (Verlangsamung von Denken und Sprache; Konzentrationsschwäche, reduzierte Motorik)

Sprache und Denken normal	0
Geringe Verlangsamung bei der Exploration	1
Deutliche Verlangsamung bei der Exploration	2
Exploration schwierig	3
Ausgeprägter Stupor	4

8. Erregung

Keine	0
Zappeligkeit	1
Spielen mit den Fingern, Haaren, usw.	2
Hin- und herlaufen, nicht still sitzen können	3
Händeringen, Nägelbeißen, Haareraufen, Lippenbeißen	4

9. Angst – psychisch

Keine Schwierigkeit	0
Subjektive Spannung und Reizbarkeit	1
Sorgt sich um Nichtigkeiten	2
Besorgte Grundhaltung, die sich im Gesichtsausdruck und in der Sprechweise äußert	3
Ängste werden spontan vorgebracht	4

10. Angst – somatisch
Körperliche Begleiterscheinungen der Angst wie: Gastrointestinale (Mundtrockenheit, Winde, Verdauungsstörungen, Durchfall, Krämpfe, Aufstoßen) – Kardiovaskuläre (Herzklopfen, Kopfschmerzen) – Respiratorische (Hyperventilation, Seufzen) – Pollakisurie - Schwitzen

Keine	0
Geringe	1
Mäßige	2
Starke	3
Extreme (Patient ist handlungsunfähig)	4

11. **Körperliche Symptome – gastrointestinale**

Keine	0
Appetitmangel, isst aber ohne Zuspruch, Schweregefühl im Abdomen	1
Muss zum Essen angehalten werden. Verlangt oder benötigt Abführmittel oder andere Magen-Darm-Präparate	2

12. **Körperliche Symptome – allgemeine**

Keine	0
Schweregefühl in Gliedern, Rücken oder Kopf, Rücken-, Kopf- oder Muskelschmerzen. Verlust der Tatkraft, Erschöpfbarkeit	1
Bei jeder deutlichen Ausprägung eines Symptoms 2 ankreuzen	2

13. **Genitalsymptome** wie etwa: Libidoverlust, Menstruationsstörungen etc.

Keine	0
Geringe	1
Starke	2

14. **Hypochondrie**

Keine	0
Verstärkte Selbstbeobachtung (auf den Körper bezogen)	1
Ganz in Anspruch genommen durch Sorgen um die eigene Gesundheit	2
Zahlreiche Klagen, verlangt Hilfe etc.	3
Hypochondrische Wahnvorstellungen	4

15. **Gewichtsverlust** (entweder a oder b ankreuzen)

a. AUS ANAMNESE	
Kein Gewichtsverlust	0
Gewichtsverlust wahrscheinlich im Zusammenhang mit jetziger Krankheit	1
Sicherer Gewichtsverlust laut Patient	2
b. NACH WÖCHENTLICHEM WIEGEN in der Klinik, wenn Gewichtsverlust	
weniger als 0,5kg / Woche	0
mehr als 0,5kg / Woche	1
mehr als 1,0kg / Woche	2

16. **Krankheitseinsicht**

Patient erkennt, dass er depressiv und krank ist	0
Räumt Krankheit ein, führt sie aber auf schlechte Ernährung, Klima, Überarbeitung, Virus, Ruhebedürfnis etc. zurück	1
Leugnet Krankheit ab	2

17. **Tagesschwankungen**

a. Geben Sie an, ob die SYMPTOME SCHLIMMER AM MORGEN ODER AM ABEND sind. Sofern KEINE Tagesschwankungen auftreten, ist 0 (= keine Tagesschwankungen) anzukreuzen.	
Keine Tagesschwankungen	0
Symptome schlimmer am Morgen	1
Symptome schlimmer am Abend	2
b. Wenn es Schwankungen gibt, geben Sie die STÄRKE DER SCHWANKUNGEN an. Falls es keine gibt, kreuzen Sie 0 (= keine) an.	
Keine	0
Gering	1
Stark	2

18. **Depersonalisation, Derealisation** wie etwa: Unwirklichkeitsgefühle, nihilistische Ideen

Keine	0
Geringe	1
Mäßige	2
Starke	3
Extreme (Patient ist handlungsunfähig)	4

19. **Paranoide Symptome**

Keine	0
Misstrauisch	1
Beziehungsideen	2
Beziehungs- und Verfolgungswahn	3

20. **Zwangssymtpome**

Keine	0
Gering	1
Stark	2

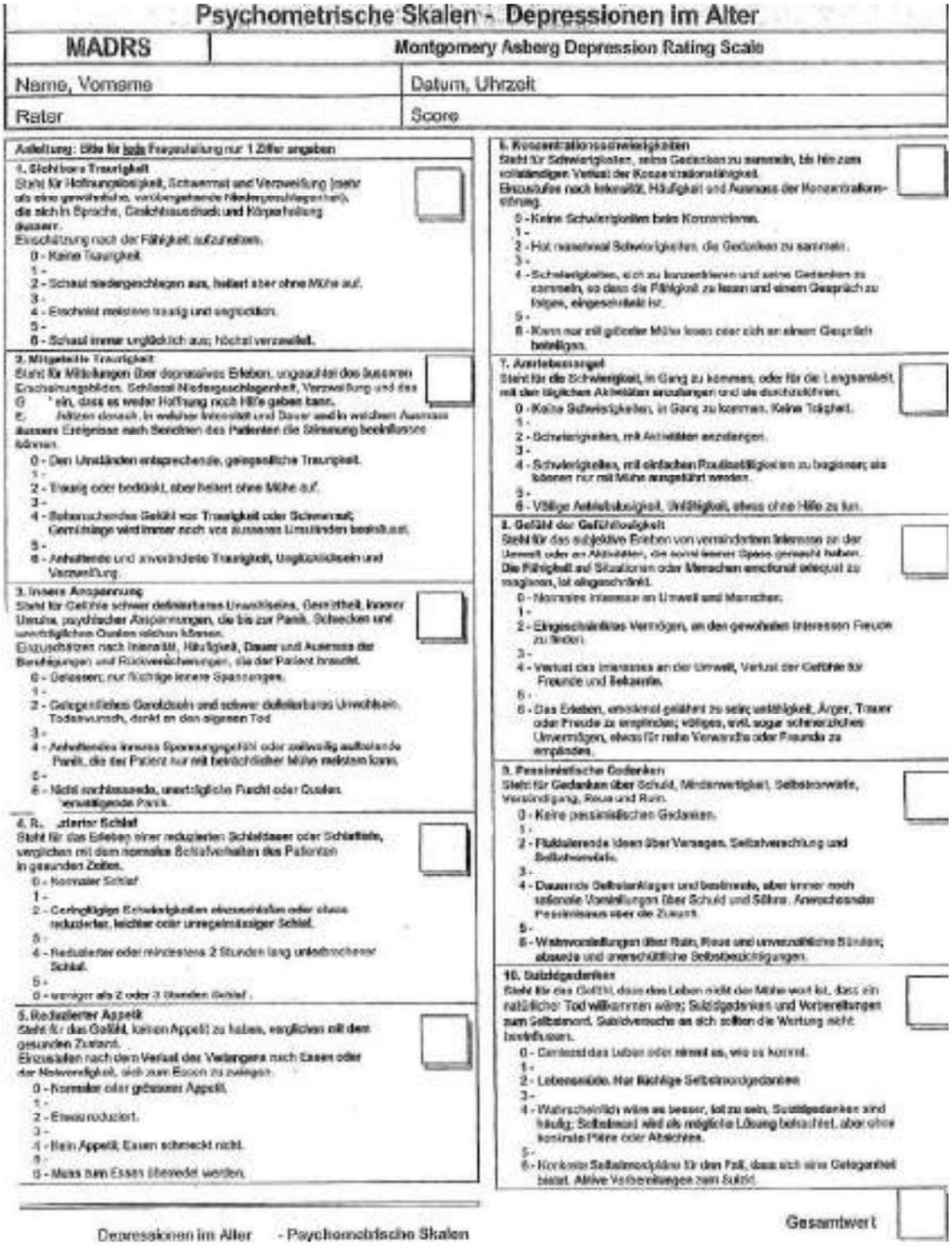
Bitte prüfen Sie, ob Sie alle Feststellungen zutreffend beantwortet haben!

SCORE:

Anm.:
- Der HAMD dient nur der Verlaufsbeobachtung nach Diagnosestellung einer depressiven Störung per ICD-10.
- Es gibt keine standardisierte Score-Einteilung. Inoffiziell können folgende Werte benutzt werden:
  Leichtgradig depressiv <18 Pt.
  Mittelgradig depressiv 18 <= x >= 25 Pt.
  Schwergradig depressiv > 25 Pt.

Source: LVR-Klinikum Essen, Clinics and Institute of the University of Duisburg-Essen, Clinic for Psychiatry and Psychotherapy, Prof. Dr. med. Jens Wiltfang, according to Beltz test, ADAS – Alzheimer`s Disease Assessment Scale

APPENDIX 2 – Survey instrument – *MADRS* depression score



Psychometrische Skalen - Depressionen im Alter

MADRS — Montgomery Asberg Depression Rating Scale

Name, Vorname | Datum, Uhrzeit

Rater | Score

Anleitung: Bitte für jede Fragestellung nur 1 Ziffer angeben

1. Sichtbare Traurigkeit
Steht für Hoffnungslosigkeit, Schwermut und Verzweiflung (mehr als eine gewöhnliche, vorübergehende Niedergeschlagenheit), die sich in Sprache, Gesichtsausdruck und Körperhaltung äußert.
Einschätzung nach der Fähigkeit aufzuheitern.
0 - Keine Traurigkeit.
1 -
2 - Scheint niedergeschlagen aus, heitert aber ohne Mühe auf.
3 -
4 - Erscheint meistens traurig und ungetröstet.
5 -
6 - Scheint immer unglücklich aus; höchst verzweifelt.

2. Mitgeteilte Traurigkeit
Steht für Mitteilungen über depressives Erleben, ungeachtet des äußeren Erscheinungsbildes. Schließt Niedergeschlagenheit, Verzweiflung und das Gefühl ein, dass es weder Hoffnung noch Hilfe geben kann.
Achten darauf, in welcher Intensität und Dauer und in welchem Ausmaß äußere Ereignisse nach Berichten des Patienten die Stimmung beeinflussen können.
0 - Den Umständen entsprechende, gelegentliche Traurigkeit.
1 -
2 - Traurig oder bedrückt, aber heitert ohne Mühe auf.
3 -
4 - Beherrschendes Gefühl von Traurigkeit oder Schwermut; Gemütslage wird immer noch von äußeren Umständen beeinflusst.
5 -
6 - Anhaltende und unveränderte Traurigkeit, Unglücklichsein und Verzweiflung.

3. Innere Anspannung
Steht für Gefühle schwer definierbaren Unwohlseins, Gereiztheit, innerer Unruhe, psychischer Anspannungen, die bis zur Panik, Schrecken und unerträglichen Qualen reichen können.
Einzuschätzen nach Intensität, Häufigkeit, Dauer und Ausmaß der Beruhigungen und Rückversicherungen, die der Patient braucht.
0 - Gelassen; nur flüchtige innere Spannungen.
1 -
2 - Gelegentliches Gereiztsein und schwer definierbares Unwohlsein. Todeswunsch, denkt an den eigenen Tod.
3 -
4 - Anhaltendes innere Spannungsgefühl oder zeitweilig auftretende Panik, die der Patient nur mit beträchtlicher Mühe meistern kann.
5 -
6 - Nicht nachlassende, unerträgliche Furcht oder Qualen, überwältigende Panik.

4. R... ierter Schlaf
Steht für das Erleben einer reduzierten Schlafdauer oder Schlaftiefe, verglichen mit dem normalen Schlafverhalten des Patienten in gesunden Zeiten.
0 - Normaler Schlaf.
1 -
2 - Geringfügige Schwierigkeiten einzuschlafen oder etwas reduzierter, leichter oder unregelmäßiger Schlaf.
3 -
4 - Reduzierter oder mindestens 2 Stunden lang unterbrochener Schlaf.
5 -
6 - weniger als 2 oder 3 Stunden Schlaf.

5. Reduzierter Appetit
Steht für das Gefühl, keinen Appetit zu haben, verglichen mit dem gesunden Zustand.
Einzuschätzen nach dem Verlust des Verlangens nach Essen oder der Notwendigkeit, sich zum Essen zu zwingen.
0 - Normaler oder gesteigerter Appetit.
1 -
2 - Etwas reduziert.
3 -
4 - Kein Appetit; Essen schmeckt nicht.
5 -
6 - Muss zum Essen überredet werden.

6. Konzentrationsschwierigkeiten
Steht für Schwierigkeiten, seine Gedanken zu sammeln, bis hin zum vollständigen Verlust der Konzentrationsfähigkeit.
Einzustufen nach Intensität, Häufigkeit und Ausmaß der Konzentrationsstörung.
0 - Keine Schwierigkeiten beim Konzentrieren.
1 -
2 - Hat manchmal Schwierigkeiten, die Gedanken zu sammeln.
3 -
4 - Schwierigkeiten, sich zu konzentrieren und seine Gedanken zu sammeln, so dass die Fähigkeit zu lesen und einem Gespräch zu folgen, eingeschränkt ist.
5 -
6 - Kann nur mit größter Mühe lesen oder sich an einem Gespräch beteiligen.

7. Antriebslosigkeit
Steht für die Schwierigkeit, in Gang zu kommen, oder für die Langsamkeit, mit den täglichen Aktivitäten anzufangen und sie durchzuführen.
0 - Keine Schwierigkeiten, in Gang zu kommen. Keine Trägheit.
1 -
2 - Schwierigkeiten, mit Aktivitäten anzufangen.
3 -
4 - Schwierigkeiten, mit einfachen Routinetätigkeiten zu beginnen; sie können nur mit Mühe ausgeführt werden.
5 -
6 - Völlige Antriebslosigkeit, Willenlosigkeit, etwas ohne Hilfe zu tun.

8. Gefühl der Gefühllosigkeit
Steht für das subjektive Erleben von verminderten Interessen an der Umwelt oder an Aktivitäten, die normalerweise Spaß gemacht haben. Die Fähigkeit auf Situationen oder Menschen emotional adäquat zu reagieren, ist eingeschränkt.
0 - Normales Interesse an Umwelt und Menschen.
1 -
2 - Eingeschränktes Vermögen, an den gewohnten Interessen Freude zu finden.
3 -
4 - Verlust des Interesses an der Umwelt, Verlust der Gefühle für Freunde und Bekannte.
5 -
6 - Das Erleben, emotional gelähmt zu sein; Unfähigkeit, Ärger, Trauer oder Freude zu empfinden; völliges, evtl. sogar schmerzliches Unvermögen, etwas für nahe Verwandte oder Freunde zu empfinden.

9. Pessimistische Gedanken
Steht für Gedanken über Schuld, Minderwertigkeit, Selbstvorwürfe, Versündigung, Reue und Ruin.
0 - Keine pessimistischen Gedanken.
1 -
2 - Flüchtige Ideen über Versagen, Selbstvorwürfe und Selbstentwertung.
3 -
4 - Dauernde Selbstanklagen und bestimmte, aber immer noch rationale Vorstellungen über Schuld und Sünde. Anwachsender Pessimismus über die Zukunft.
5 -
6 - Wahnvorstellungen über Ruin, Reue und unverzeihliche Sünden; absurde und unerschütterliche Selbstbezichtigungen.

10. Suizidgedanken
Steht für das Gefühl, dass das Leben nicht der Mühe wert ist, dass ein natürlicher Tod willkommen wäre; Suizidgedanken und Vorbereitungen zum Selbstmord. Suizidversuche an sich sollen die Wertung nicht beeinflussen.
0 - Genießt das Leben oder nimmt es, wie es kommt.
1 -
2 - Lebensmüde. Hat flüchtige Selbstmordgedanken.
3 -
4 - Wahrscheinlich wäre es besser, tot zu sein. Suizidgedanken sind häufig; Selbstmord wird als mögliche Lösung betrachtet, aber ohne konkrete Pläne oder Absichten.
5 -
6 - Konkrete Selbstmordpläne für den Fall, dass sich eine Gelegenheit bietet. Aktive Vorbereitungen zum Suizid.

Gesamtwert

Depressionen im Alter - Psychometrische Skalen

Source: LVR-Klinikum Essen, Clinics and Institute of the University of Duisburg-Essen, Clinic for Psychiatry and Psychotherapy, Prof. Dr. med. Jens Wiltfang, according to Beltz test, ADAS – Alzheimer`s Disease Assessment Scale

APPENDIX 3 – Survey instrument – Application mode *dementia garden*

Dokumentation zur wissenschaftlichen Begleitung des Demenzgarten-Projekts

1) Allgemeines

Patient: Codierung:

Datum: Uhrzeit von: bis: Uhr

Begleiter: Gruppengröße: Personen

2) Zur Bewohnerin/zum Bewohner allgemein

a) Bew. war insgesamt vom Verhalten normal/unauffällig ☐ ja ☐ nein
Wenn nein, kurze Erläuterung:

☐ Bew. ließ sich problemlos zum Garten-Rundgang motivieren
☐ Bew. ließ sich nur schwer zum Garten-Rundgang motivieren
☐ Bew. ließ sich gar nicht zum Garten-Rundgang motivieren

3) Zur Bewohnerin/zum Bewohner beim Garten-Rundgang

Bewohnerin/Bewohner war

☐ interessiert	☐ desinteressiert
☐ aufmerksam	☐ unruhig
☐ motivierbar	☐ abweisend
☐ gut führbar	☐ unmotiviert
☐ eigeninitiativ	☐ zurückhaltend
☐ aufgeschlossen	☐ ängstlich
☐ selbstbewusst	☐ aggressiv (verbal/körperlich)

☐ Bew. absolvierte den gesamten Garten-Rundgang.
☐ Bew. brach den Garten-Rundgang ab.

Gab es für den Abbruch einen erkennbaren Grund? ☐ ja ☐ nein
Wenn ja, kurze Erläuterung:

4) Zur Stimmung der Bewohnerin/des Bewohners

Vor dem Gartenrundgang

☐ entspannt	☐ angespannt
☐ ruhig	☐ unruhig
☐ ausgeglichen/normal	☐ unausgeglichen (niedergedrückt/euphorisch)
☐ heiter	☐ betrübt

Nach dem Gartenrundgang

☐ entspannt	☐ angespannt
☐ ruhig	☐ unruhig
☐ ausgeglichen/normal	☐ unausgeglichen (niedergedrückt/euphorisch)
☐ heiter	☐ betrübt

5)Aktivitäten im Garten

a) Womit hat sich die Gruppe während des Gartenrundgangs beschäftigt und wie war das Interesse der Bewohnerin/des Bewohners?

	hoch	eher hoch	normal	eher gering	gering
☐ Weidenbögen					
☐ Robinienpfähle					
☐ Steinblöcke					
☐ Handläufe					
☐ Außenbank					
☐ Hochbeet					

b) Ergotherapeutische Maßnahmen

c) Wie hoch war das Interesse der Bewohnerin/des Bewohners

	hoch	eher hoch	normal	eher gering	gering
☐ an sozialer Interaktion					
☐ am Umfeld					

Source: LVR-Klinikum Essen, Clinics and Institute of the University of Duisburg-Essen, Clinic for Psychiatry and Psychotherapy, Prof. Dr. med. Jens Wiltfang, created by the study team "Demenzgarten"

APPENDIX 4 - Survey instrument – 3-D cognitive mapping (memory performance regarding various spatial objects)

questionnaire of an oral survey

Date:_____

Resident: _____Form filler:_____

What do you remember after walking outside?

spatial object	**Direction was correct shown**	**model was set**	**model was correctly placed**	**sum**
1st Pavilion				
2nd fountain				
3. Stone blocks				
4. Robinia posts				
5. Lawn bench				
sum				

self-proclaimed Small details	location correctly described	direction correctly shown	sum
…			
…			
…			
sum			

What is the central place of the garden? _____

Where would I most like to go today?_____

Source: Teimann

APPENDIX 5 - Survey instrument – family member satisfaction

Evaluation of the Dementia Garden Project (2011 – 2013) in *Das Dorf – Wohnen im Alter* of the Theodor Fliedner Foundation, Mülheim adR

6 ANSWERS TO 6 QUESTIONS

You will help us with the internal project evaluation. The survey is voluntary. A stamped envelope is enclosed.

Name of the participant:

_____

1) The sensory garden is an enrichment for “The Village – Living in Old Age” of the Theodor-Fliedner Foundation.

ÿ do not agree ÿ rather disagree ÿ neither ÿ rather agree ÿ completely agree

2) I often used the garden with my relative.

ÿ do not agree ÿ rather disagree ÿ neither ÿ rather agree ÿ completely agree

3) I have often participated in occupational therapy sessions with my relative, events and festivals.

ÿ do not agree ÿ rather disagree ÿ neither ÿ rather agree ÿ completely agree

4) During the project period, I tried to visit my To enable relatives to use the garden together.

ÿ do not agree ÿ rather disagree ÿ neither ÿ rather agree ÿ completely agree

5) I see the sensory garden as a supportive therapeutic offer in the care
of people with dementia.

ÿ do not agree ÿ rather disagree ÿ neither ÿ rather agree ÿ completely agree

6) I have the impression that my relative is affected by the regular
benefited from visits to the sensory garden.

ÿ do not agree ÿ rather disagree ÿ neither ÿ rather agree ÿ completely agree

Open comment:

_____

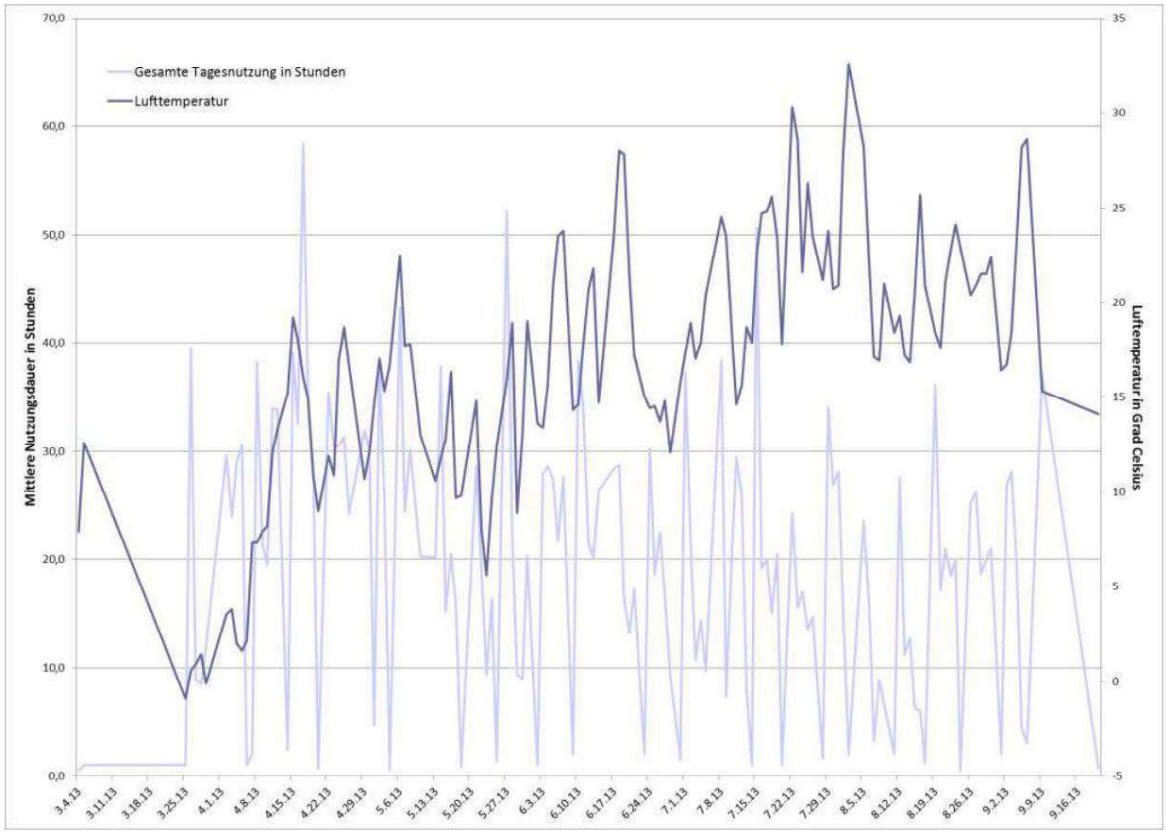
_____

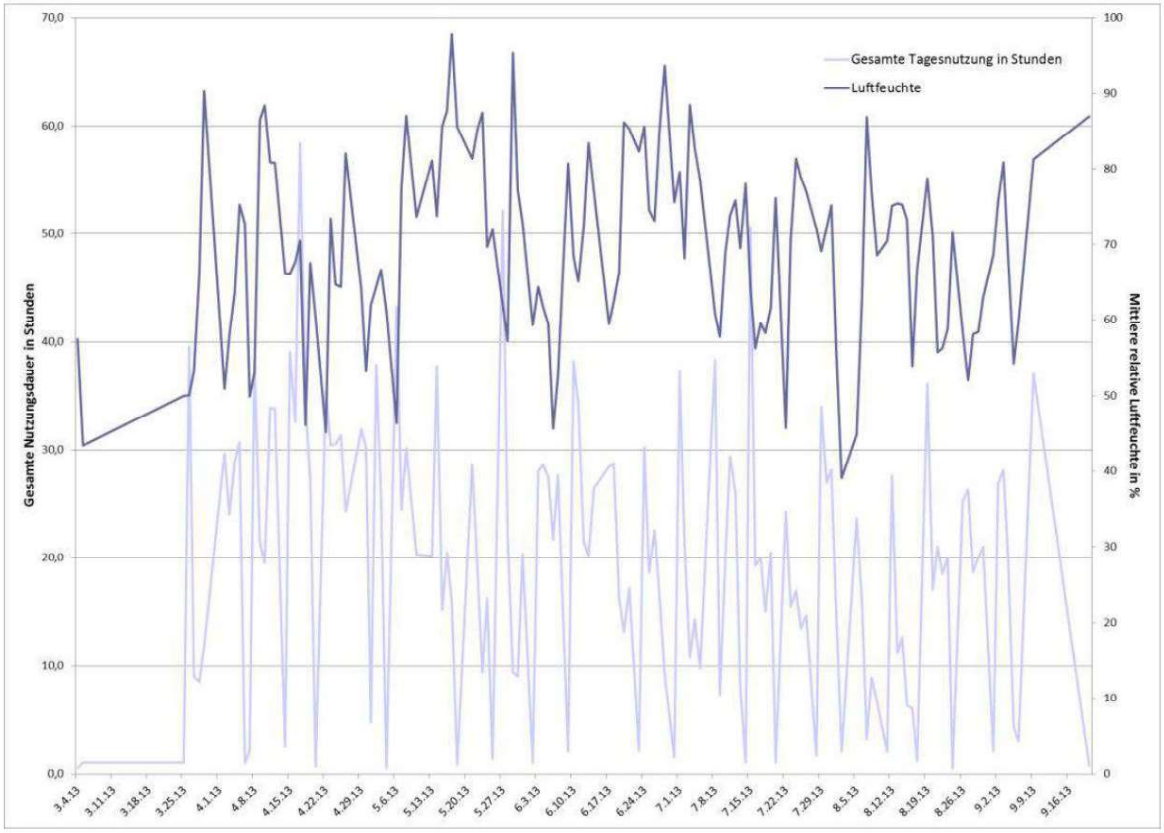
_____

_____

Source: LVR-Klinikum Essen, Clinics and Institute of the University of Duisburg-Essen, Clinic for Psychiatry and Psychotherapy, Prof. Dr. med. Jens Wiltfang, created by the study team "Demenzgarten"

APPENDIX 6 – Meteorological data evaluation – Air temperature (°C) and daily mean the relative humidity in %





ANNEX 7 – Relationship between average service life and temperature and between usage time and social activity

		air temperature in degrees C
Duration min.	Pearson correlation	,120**
	Sig. (2-sided)	,000
	N	2933

		daily mean of the rel. humidity in percent
Duration min.	Pearson correlation	-,040*
	Sig. (2-sided)	,032
	N	2933

		Appointment with social activity
Duration min.	Pearson correlation	,175**
	Sig. (2-sided)	,000
	N	2933
	N	2933

ANNEX 8 – Air temperature ranges in relation to the service life of the dementia garden

air temperature in 2 m altitude at 11:00, UTC (Classified)			sum of useful life in minutes	Average usage time per tour in minutes	sum of useful life in Hours	Average usage time per tour in hours	number of tours
-4.99 - ,00	-4.99 - ,00	mean	384.50	69.3889	6.41	1.1565	5.00
	-4.99 - ,00	standard deviation	458,912	13.27789	7,649	,22130	5,657
	-4.99 - ,00	Minimum	60	60.00	1	1.00	1
	-4.99 - ,00	Maximum	709	78.78	12	1.31	9
	-4.99 - ,00	Total	769	138.78	13	2.31	10
	-4.99 - ,00	H	2	2	2	2	2
,01 - 5,00	,01 - 5,00	mean	1020.50	53.5099	17.01	,8918	20.50
	,01 - 5,00	standard deviation	744,698	6.53965	12,412	,10899	15,871
	,01 - 5,00	minimum	60	44.84	1	,75	1
	,01 - 5.00	Maximum	1843	60.00	31	1.00	37
	,01 - 5.00	total	6123	321.06	102	5.35	123
	,01 - 5,00	H	6	6	6	6	6
5.01 - 10.00	5.01 - 10.00	mean	575.30	49.2396	9.59	,8207	11.30
	5.01 - 10.00	standard deviation	496,400	9.19440	8,273	,15324	9,956
	5.01 - 10.00	minimum	30	30.00	1	,50	1
	5.01 - 10.00	maximum	1284	62.50	21	1.04	27
	5.01 - 10.00	total	5753	492.40	96	8.21	113
	5.01 - 10.00	H	10	10	10	10	10
10.01 - 15.00	10.01 - 15.00	mean	1119.92	54.0519	18.67	,9009	22.40
	10.01 - 15.00	standard deviation	777,788	14.88762	12,963	,24813	16,010
	10.01 - 15.00	minimum	45	40.00	1	,67	1
	10.01 - 15.00	Maximum	2269	120.00	38	2.00	46
	10.01 - 15.00	total	27998	1351.30	467	22.52	560
	10.01 - 15.00	H	25	25	25	25	25
15.01 - 20.00	15.01 - 20.00	mean	1127.29	57.5269	18.79	,9588	19.97
	15.01 - 20.00	standard deviation	795,272	20.80975	13,255	,34683	13,354
	15.01 - 20.00	minimum	30	27.86	1	,46	1
	15.01 - 20.00	Maximum	3505	160.00	58	2.67	48
	15.01 - 20.00	total	39455	2013.44	658	33.56	699
	15.01 - 20.00	H	35	35	35	35	35
20.01 - 25.00	20.01 - 25.00	mean	1067.06	52.8700	17.78	,8812	19.97
	20.01 - 25.00	standard deviation	508,379	11.73555	8,473	,19559	8,765
	20.01 - 25.00	minimum	30	30.00	1	,50	1
	20.01 - 25.00	maximum	2040	99.00	34	1.65	33
	20.01 - 25.00	total	33079	1638.97	551	27.32	619
	20.01 - 25.00	H	31	31	31	31	31
25.01 - 30.00	25.01 - 30.00	mean	782.22	56.8305	13.04	,9472	13.44
	25.01 - 30.00	standard deviation	473,129	7.96247	7,885	,13271	6,930
	25.01 - 30.00	minimum	180	43.33	3	,72	3
	25.01 - 30.00	Maximum	1725	71.88	29	1.20	24
	25.01 - 30.00	total	7040	511.47	117	8.52	121
	25.01 - 30.00	H	9	9	9	9	9
30.01+	30.01+	mean	120.00	30,0000	2.00	,5000	4.00
	30.01+	standard deviation					
	30.01+	minimum	120	30.00	2	,50	4
	30.01+	maximum	120	30.00	2	,50	4
	30.01+	sum	120	30.00	2	,50	4
	30.01+	H	1	1	1	1	1
total		mean	1011.24	54.6001	16.85	,9100	18.90
		standard deviation	686,332	15.29783	11,439	,25496	12,669
		minimum	30	27.86	1	,46	1
		maximum	3505	160.00	58	2.67	48
		sum	120337	6497.42	2006	108.29	2249
		H	119	119	119	119	119

APPENDIX 9 – Comparison of memory performance regarding the spatial objects to which 3 severity of dementia

Cross table Pavillion - hits in total*severity of dementia

			severity of dementia			
			light	moderately difficult	difficult	total
Pavillion - Total hits	0	Number	5	5	5	15
		% in Pavillion - Total hits	33.3%	33.3%	33.3%	100.0%
	1	Number	1	3	0	4
		% in Pavillion - Total hits	25.0%	75.0%	0.0%	100.0%
	2	Number	1	3	0	4
		% in Pavillion - Total hits	25.0%	75.0%	0.0%	100.0%
	3	Number	2	4	0	6
		% in Pavillion - Total hits	33.3%	66.7%	0.0%	100.0%
total		Number	9	15	5	29
		% in Pavillion - Total hits	31.0%	51.7%	17.2%	100.0%

Cross table Brunnen - hits in total*severity of dementia

			severity of dementia			
			light	moderately difficult	difficult	total
Brunnen - Total hits	0	Number	6	9	4	19
		% in wells - hits in total	31.6%	47.4%	21.1%	100.0%
	1	Number	0	1	1	2
		% in wells - hits in total	0.0%	50.0%	50.0%	100.0%
	2	Number	1	1	0	2
		% in wells - hits in total	50.0%	50.0%	0.0%	100.0%
	3	Number	2	4	0	6
		% in wells - hits in total	33.3%	66.7%	0.0%	100.0%
total		Number	9	15	5	29
		% in wells - hits in total	31.0%	51.7%	17.2%	100.0%

Cross table stone blocks - hits in total*severity of dementia

			severity of dementia			
			light	moderately difficult	difficult	total
Stone blocks - total hits	0	Number	4	7	3	14
		% in stone blocks - hits in total	28.6%	50.0%	21.4%	100.0%
	1	Number	1	2	1	4
		% in stone blocks - hits in total	25.0%	50.0%	25.0%	100.0%
	2	Number	0	0	1	1
		% in stone blocks - hits in total	0.0%	0.0%	100.0%	100.0%
	3	Number	4	6	0	10
		% in stone blocks - hits in total	40.0%	60.0%	0.0%	100.0%
total		Number	9	15	5	29
		% in stone blocks - hits in total	31.0%	51.7%	17.2%	100.0%

Cross table Robinia posts - hits in total*severity of dementia

			severity of dementia			
			light	moderately difficult	difficult	total
Robinia posts - total hits	0	Number	7	11	3	21
		% in Robinia posts - hits in total	33.3%	52.4%	14.3%	100.0%
	1	Number	0	2	2	4
		% in Robinia posts - hits in total	0.0%	50.0%	50.0%	100.0%
	2	Number	0	1	0	1
		% in Robinia posts - hits in total	0.0%	100.0%	0.0%	100.0%
	3	Number	2	1	0	3
		% in Robinia posts - hits in total	66.7%	33.3%	0.0%	100.0%
total		Number	9	15	5	29
		% in Robinia posts - hits in total	31.0%	51.7%	17.2%	100.0%

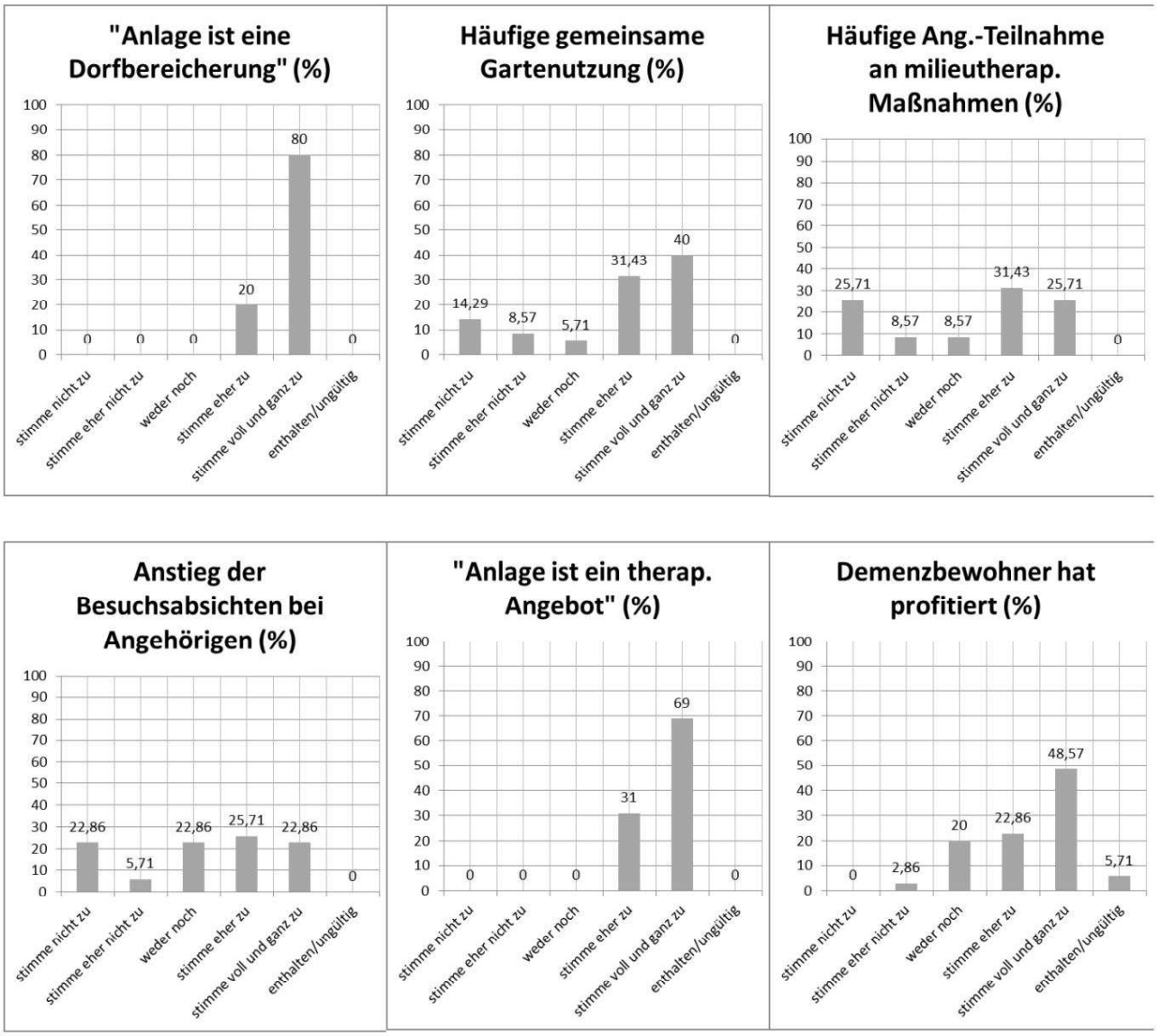
Cross table Rasenbank - hits in total*severity of dementia

			severity of dementia			
			light	moderately difficult	difficult	total
Rasenbank - Total hits	0	Number	1	7	4	12
		% in lawn bank - hits in total	8.3%	58.3%	33.3%	100.0%
	1	Number	2	2	1	5
		% in lawn bank - hits in total	40.0%	40.0%	20.0%	100.0%
	2	Number	1	2	0	3
		% in lawn bank - hits in total	33.3%	66.7%	0.0%	100.0%
	3	Number	5	4	0	9
		% in lawn bank - hits in total	55.6%	44.4%	0.0%	100.0%
total		Number	9	15	5	29
		% in lawn bank - hits in total	31.0%	51.7%	17.2%	100.0%

0 = no hit, 1 = object direction was shown correctly, 2 = object model was set, 3 = object model was set correctly

APPENDIX 10 – Individual graphics for data analysis of the *effectiveness* questionnaire

"Dementia Garden in the Neighborhood"



Source: LVR-Klinikum Essen, Clinics and Institute of the University of Duisburg-Essen, Clinic for Psychiatry and Psychotherapy, Prof. Dr. med. Jens Wiltfang, created by the study team "Demenzgarten"