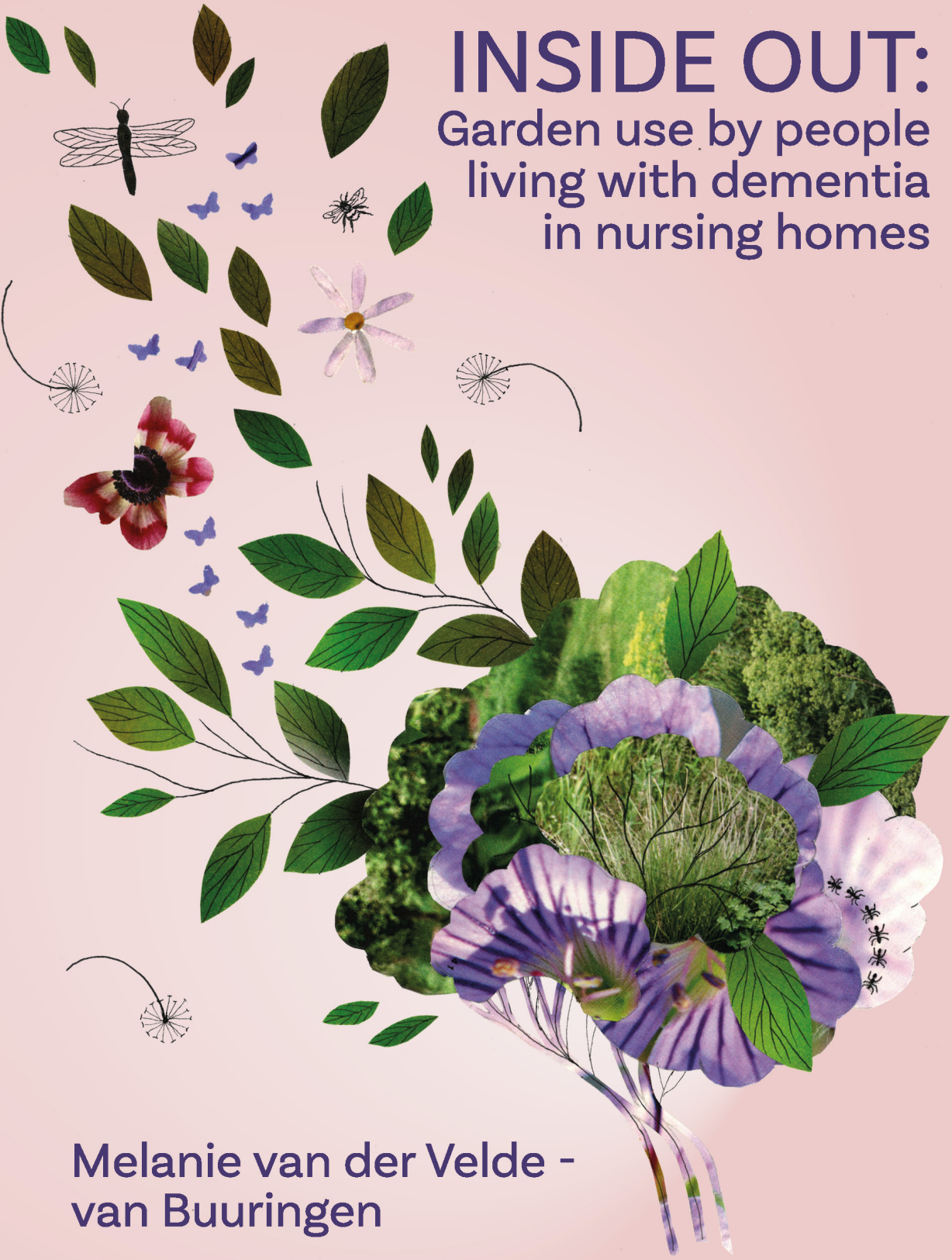
INSIDE OUT:
Garden use by people living with dementia in nursing homes



Melanie van der Velde - van Buuringen

INSIDE OUT: GARDEN USE BY PEOPLE LIVING WITH DEMENTIA IN NURSING HOMES

Melanie van der Velde – van Buuringen

COLOPHON

The work in this thesis was conducted at the department of Public Health and Primary Care of the Leiden University Medical Center.

Academic network for research in elderly care
The studies in this thesis took place in the University Network for the Care Sector South Holland (UNC-ZH). In this network, the Leiden University Medical Center (LUMC) collaborates structurally with 12 elderly care organizations in South Holland (Aafje, ActiVite, Argos Zorggroep, Florence, Haagse Wijk- en Woonzorg, Laurens, Marente, Pieter van Foreest, Saffier, Topaz, Woonzorgcentra Haaglanden, Zonnehuisgroep Vlaardingen).

Caregivers, policymakers, researchers, students, residents and relatives work together to improve the quality of care and quality of life for vulnerable older people. The UNC-ZH is a regional platform, inspirator and learning network for innovation in long-term care. Research, education and training, and practice are closely related.

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INSIDE OUT: Garden use by people living with dementia in nursing homes

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“Nature is not a place to visit.
It is home.”

-Gary Snyder, poet

“The Etiquette of Freedom” (from the collection of essays,
The Practice of the Wild, San Francisco, North Point Press, 1990)

CONTENTS

1

General introduction

CASE

Mrs. Acrelife is a tall but frail 87-year-old woman living with dementia in a psychogeriatric ward on the second floor of a nursing home in the Netherlands. In her younger years she worked as a secretary at a bank, until she married and had her first child. She was happily married when her husband died at a young age. Mrs. Acrelife learned to be assertive and independent in order to take good care of her children and she lives her life to the fullest. She really enjoys being outside to relieve the stress from her daily life.

One of her first days on the ward, Mrs. Acrelife looked out the window and saw a blue sky. "*I am going to sit outside. The weather is so nice!*", she said. But the doors on this ward are always locked and Mrs. Acrelife could not go outside alone. She did not know how the (also locked) elevator works, she did not know the route to the garden, and she easily lost her way when she was in the garden.

One of the nurses experienced a stress response when she heard Mrs. Acrelife wanted to go outside. She thought "*Of course she deserves to go and sit outside, but where, when and with whom? I still have so much to do and there are no colleagues to stay with the other residents. And is it actually part of my job*?". The caregiver did not see a possibility to accompany Mrs. Acrelife to go outside, so she offered her a cup of coffee. Mrs. Acrelife did not want coffee, she wanted to go outside… and then she became agitated. The blue sky kept reminding her that she wanted to go and sit outside.

That day, Mrs. Acrelife ended up in a negative spiral, became restless and agitated, made other residents restless and agitated with her behavior, and was given medication to calm her down. "*The psychologist really has to come and observe her again, because this behavior is unacceptable*" the nursing staff wrote in the electronic patient record…

DEMENTIA

One in three women and one in seven men will be diagnosed with dementia at some point in their lives.[1] At this moment, there are more than 55 million people living with dementia worldwide, with nearly 10 million new cases each year.[2] It is one of the leading causes of disability and dependency among older people. [2]

As of 2013, the term 'dementia' has been replaced by 'neurocognitive disorder' in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5).[3] In practice, however, the term dementia is still widely used, which is why it will be used throughout this thesis.

Dementia is a term used to describe a variety of progressive diseases in which neurocognitive impairments is the main symptom.[2, 3] There are more than fifty different diseases that can cause dementia, with Alzheimer's disease being the most common, accounting for 60–70% of all cases.[2, 4, 5] Other examples are vascular dementia (22%), frontotemporal dementia (4%), and Lewy body dementia (2%).[4, 5]

Dementia can be diagnosed when there is evidence of a significant cognitive decline from a previous level of functioning in one or more cognitive domains (complex attention, executive function, learning and memory, language, perceptual-motor, or social cognition).[3] These deficits clearly interfere with independence in everyday activities, such as needing help when the person living with dementia wants to go outside.[3] In addition to these neurocognitive domains, nearly all people living with dementia will be affected by behavioral and psychological changes over the course of their illness, such as restless behavior and agitation.[6, 7] Because of these progressive impairments, people living with dementia will need more and more help from others to fulfill their own needs.[8]

TRADITIONAL NURSING HOMES IN THE NETHERLANDS

In the Netherlands, there are 300,000 people living with dementia. Of these individuals, 80,000-113,000 live in long-term care facilities (LTCF).[1, 9] Long-term care facilities consist of traditional nursing homes and innovative living arrangements. Long-term care facilities are regarded as innovative when they aim to substantially change the physical, social, and organizational environment to promote person-centered care, and present themself as an alternative to traditional nursing home care.[10] Examples include small-scale living facilities within larger nursing homes, stand-alone units in the neighborhood, and more recently, green care farms.[11]

This thesis focuses on traditional nursing homes. Since the "Wet op Bejaardenoorden" (Act on Old People's Homes) of 1963, it has been possible to build nursing homes in the Netherlands.[12] The first traditional nursing home was built in 1965 and many more followed.[12] These buildings represent the traditional nursing homes we see today. Care in these traditional nursing homes was based on a medical model. These facilities looked and operated like hospitals, emphasizing medical care, and treating residents as patients. It was common for residents to share rooms with others, and wards of up to 30 residents were not uncommon. [13-15] In recent years this traditional model has shifted more towards a home-like environment that emphasizes that residents are individuals with their own stories and needs.[13] Groups are much smaller, and daily life is as 'normal' as possible, integrating care with domestic activities.[16]

In practice, this means that many of the traditional nursing home buildings we see today still have the hospital-like structure they had when they were built in the 1960s and 1970s. Long hallways and many locked doors that keep residents safe inside, almost like a safe cocoon [17-19]. Not every nursing home has outdoor space; some have only balconies, others have small terraces. None of the buildings are designed to make going outside a part of daily nursing home practice.

NATURE

The "outside" provides an opportunity to connect with nature. Nature refers to physical features and processes of nonhuman origin, including the "living nature" of flora and fauna, still and running water, air quality, weather, and landscapes.[20] This connection may be an unconscious, innate need.[21, 22] The biophilia hypothesis suggests that humans have an affinity with the natural world from birth.[21, 22] This bond with nature is rooted in our evolutionary past, when survival depended on focusing your attention on natural cues.[21] As a result, people tend to prefer natural environments with elements like trees, water, and open landscapes over built, artificial environments.[21] Exposure to nature has direct beneficial effects on stress and indirect benefits on physical activity and social interactions. In turn these have a positive impact on health and well-being.[20] For people living with dementia in nursing homes, the nursing home garden is an important, and probably the only, means of getting outside and experiencing nature.

GARDEN USE IN TRADITIONAL NURSING HOMES

The definition of a garden, and the definition of garden use, varies widely in terms of scale, function, and activity.[23] While gardens are often perceived as intimate, private spaces adjacent to private homes, they can also be large and formal, such as those found in nursing homes.[23] Garden use in nursing homes encompasses a wide range of activities, both individual and communal. Examples include horticultural therapy, which uses plant-related activities as a therapeutic modality to achieve goals, and green care farms, which combine agricultural and care activities.[11, 24]

In this thesis, the term garden use refers to any activity in the nursing home garden that is tailored to the residents' wishes and preferences, and that fits within the usual activities of daily nursing home practice. This includes doing an activity outside that is usually done indoors, such as sitting, eating lunch, or walking.

EFFECTS OF GARDEN USE

In recent years, there has been growing interest in the effects of garden use on people living with dementia in nursing homes. Studies have shown improvements in quality of life, anxiety, depression, social relationships, and physical and cognitive abilities in nursing home residents.[24] Studies focusing on nursing home residents living with dementia showed improvements in levels of engagement, quality of life, behavioral and psychological symptoms of dementia, stress, sleep, and mood.[24-37]

Qualitative studies have explored the benefits, personalization, and effects of garden use. These studies revealed themes regarding the experiences of people living with dementia, staff, and relatives, as well as possible mechanisms of the positive effects of garden use.[25, 38, 39] Garden use appears to have a positive effect by facilitating a sense of freedom, stimulating activities and reminiscence, providing sensory stimulation and pleasure, a normalizing context for social interaction, and having a calming effect.[25, 38, 39]

Despite these benefits, garden use is not a regular part of daily nursing home practice. Approximately 30% of all residents living in nursing homes go outside rarely, never, or only once a month, while almost half of them would like to go outside more often.[40]

AIM AND OUTLINE OF THIS THESIS

The overall aim of the studies presented in this thesis is to gain a better understanding of how garden use can be integrated into daily nursing home practice. To this end, the following three research questions are addressed:

1. What is the effect of garden use on quality of life, neuropsychiatric symptoms, and daily life?
2. How often do people living with dementia in nursing homes go outside and which resident characteristics are associated with the frequency of going outside?
3. How should a nursing home garden be designed?

These research questions are addressed in the chapters in this thesis. First, we discuss the systematic review, which is presented in Chapter 2. This study narratively summarizes the results of quantitative, qualitative, and mixed-methods studies that describe the effects of garden use on quality of life, behavioral and psychological symptoms of dementia, or other outcomes related to quality of life or behavioral and psychological symptoms of dementia in people living with dementia in nursing homes.

In Chapter 3 we examine the frequency of going outside for people living with dementia in nursing homes in the Netherlands and the characteristics that are associated with going outside. This cross-sectional study uses data from a study that was conducted by Statistics Netherlands (CBS) in collaboration with The Netherlands Institute for Social Research (SCP) that aimed to provide a national overview of the living situation, perceived quality of life and care for older nursing home residents in the Netherlands.

Chapter 4 presents the results of the feasibility study. This intervention study had a mixed-methods design that incorporated both quantitative (questionnaires) and qualitative (questionnaires, interviews, participant diaries, and notes and memos) data. The process of implementing the intervention was evaluated based on usefulness, feasibility and applicability.

Chapter 5 presents the results of "the Vitality Garden" study, which evaluated the effects of the multicomponent garden use intervention on garden use, daily life and quality of life of people living with dementia in a nursing home. The effectiveness of the intervention was examined in a pretest-posttest study with follow-up measurements comparing garden use, daily life and quality of life during baseline to postintervention, and a one-year follow-up.

Chapter 6 describes the development process of the Nursing Home Garden Toolkit. This toolkit was developed as part of the Vitality Garden study, which included designing a nursing home garden based on evidence-based practice.

Chapter 7, the general discussion, presents the main findings of this thesis and offers a broader perspective on these findings, as well as methodological considerations. Implications for clinical practice, education, policy, and future research are outlined.

REFERENCES

1. Alzheimer Nederland, *Factsheet cijfers en feiten over dementie*. 2021.
2. World Health Organization, *Fact-sheet Dementia*. 2023 15-03-2023 [cited 2024 04-04-2024]; Available from: https://www.who.int/news-room/fact-sheets/detail/dementia.
3. American Psychiatric Association, *Diagnostic and statistical manual of mental disorders (5th ed., text rev.)*. 2022.
4. Centrum Volksgezondheid, Zorg en Maatschappij van het Rijksinstituut voor Volksgezondheid en Milieu, *Dementie | Verantwoording | Definities*. 04-04-2024]; Available from: https://www.vzinfo.nl/dementie/verantwoording/definities.
5. Francke, A., Heide, I. van der, Bruin, S. de, Gijsen, R., Poos, R., Verbeek, M., Wiegers, T., Willemse, B. *Een samenhangend beeld van dementie en dementiezorg: kerncijfers, behoeften, aanbod en impact. Themarapportage van de Staat van Volksgezondheid en Zorg*. 2018.
6. Kales, H.C., L.N. Gitlin, and C.G. Lyketsos, *Assessment and management of behavioral and psychological symptoms of dementia.* BMJ : British Medical Journal, 2015. 350.
7. Lyketsos, C.G., et al., *Neuropsychiatric symptoms in Alzheimer's disease*. Alzheimer's & Dementia, 2011. 7(5): p. 532-539.
8. Cipriani, G., et al., *Daily functioning and dementia.* Dement Neuropsychol, 2020. 14(2): p. 93-102.
9. Sociaal en Cultureel Planbureau and Centraal Bureau voor de Statistiek, *Ouderen in Instellingen 2019 - OII 2019*. 2020, DANS Data Station Social Sciences and Humanities.
10. Brouwers, M., et al., *The Challenges of Moving from Regular Nursing Homes toward Innovative Long-Term Care Settings: An Interpretative Description Study of Staff Experiences*. Journal of Aging and Environment: p. 1-19.
11. de Boer, B., et al., *Green Care Farms as Innovative Nursing Homes, Promoting Activities and Social Interaction for People With Dementia.* J Am Med Dir Assoc, 2017. 18(1): p. 40-46.
12. Verbeek-Oudijk, D., van Campen, Cretien. *Ouderen in verpleeghuizen en verzorgingshuizen. Landelijk overzicht van hun leefsituatie in 2015/'16*. 2017.
13. World Health Organization, *World Report on Ageing and Health*. 2015: Geneva, Switzerland. p. 129.
14. Pot, A.M., *Improving nursing home care for dementia: is the environment the answer?* Aging & Mental Health, 2013. 17(7): p. 785-787.
15. te Boekhorst, S., et al., *The effects of group living homes on older people with dementia: a comparison with traditional nursing home care*. Int J Geriatr Psychiatry, 2009. 24(9): p. 970-8.
16. Willemse, B.M., et al., *Nursing home care for people with dementia and residents' quality of life, quality of care and staff well-being: Design of the Living Arrangements for people with Dementia (LAD) - study.* BMC Geriatrics, 2011. 11(1): p. 11.
17. Chaudhury, H., et al., *The Influence of the Physical Environment on Residents With Dementia in Long-Term Care Settings: A Review of the Empirical Literature.* Gerontologist, 2018. 58(5): p. e325-e337.
18. Fleming, R., et al., *The relationship between the quality of the built environment and the quality of life of people with dementia in residential care.* Dementia (London), 2016. 15(4): p. 663-80.
19. Marquardt, G., K. Bueter, and T. Motzek, *Impact of the Design of the Built Environment on People with Dementia: An Evidence-Based Review.* HERD, 2014. 8(1): p. 127-157.
20. Hartig, T., et al., *Nature and health.* Annu Rev Public Health, 2014. 35: p. 207-28.
21. Kellert, S.R., and Wilson, E.O., *The Biophilia Hypothesis*. 2013, Island Press: Washington, D.C.
22. Wilson, E.O., *Biophilia*. 1984, Harvard University Press: Cambridge, Mass.
23. Buck, D., *Gardens and health: Implications for policy and practice*. 2016.

24. Nicholas, S.O., A.T. Giang, and P.L.K. Yap, *The Effectiveness of Horticultural Therapy on Older Adults: A Systematic Review.* Journal of the American Medical Directors Association, 2019. 20(10): p. 1351. e1-1351.e11.

25. Whear, R., et al., *What is the impact of using outdoor spaces such as gardens on the physical and mental well-being of those with dementia? A systematic review of quantitative and qualitative evidence.* J Am Med Dir Assoc, 2014. 15(10): p. 697-705.

26. Detweiler, M.B., et al., *Scheduled medications and falls in dementia patients utilizing a wander garden.* Am J Alzheimers Dis Other Demen, 2009. 24(4): p. 322-32.

27. Detweiler, M.B., et al., *Does a wander garden influence inappropriate behaviors in dementia residents?* Am J Alzheimers Dis Other Demen, 2008. 23(1): p. 31-45.

28. Murphy, P.F., et al., *Longitudinal analysis of differential effects on agitation of a therapeutic wander garden for dementia patients based on ambulation ability.* Dementia, 2010. 9(3): p. 355-373.

29. Calkins, M., J.G. Szmerekovsky, and S. Biddle, *Effect of Increased Time Spent Outdoors on Individuals with Dementia Residing in Nursing Homes.* Journal of Housing for the Elderly, 2007. 21(3-4): p. 211-228.

30. Cohen-Mansfield, J., *Outdoor wandering parks for persons with dementia.* Journal of Housing for the Elderly, 2007. 21(1-2): p. 35-53.

31. Connell, B.R., J.A. Sanford, and D. Lewis, *Therapeutic Effects of an Outdoor Activity Program on Nursing Home Residents with Dementia.* Journal of Housing for the Elderly, 2007. 21(3-4): p. 195-209.

32. Cox, H., I. Burns, and S. Savage, *Multisensory environments for leisure: promoting well-being in nursing home residents with dementia.* J Gerontol Nurs, 2004. 30(2): p. 37-45.

33. Edwards, C.A., C. McDonnell, and H. Merl, *An evaluation of a therapeutic garden's influence on the quality of life of aged care residents with dementia.* Dementia (London), 2013. 12(4): p. 494-510.

34. Goto, S., et al., *The Positive Effects of Viewing Gardens for Persons with Dementia.* J Alzheimers Dis, 2018. 66(4): p. 1705-1720.

35. Hernandez, R.O., *Effects of Therapeutic Gardens in Special Care Units for People with Dementia: Two Case Studies.* Journal of Housing for the Elderly, 2007. 21(1-2): p. 117-152.

36. Mather, J.A., D. Nemecek, and K. Oliver, *The effect of a walled garden on behavior of individuals with Alzheimer's.* American Journal of Alzheimer's Disease, 1997. 12(6): p. 252-257.

37. White, P.C., et al., *Exposure to nature gardens has time-dependent associations with mood improvements for people with mid- and late-stage dementia: Innovative practice.* Dementia (London), 2018. 17(5): p. 627-634.

38. Evans, S.C., et al., *Connections with nature for people living with dementia.* Working with Older People, 2019. 23(3): p. 142-151.

39. Hendriks, I.H., et al., *Nature and dementia: development of a person-centered approach.* International Psychogeriatrics, 2016. 28(9): p. 1455-1470.

40. Verbeek-Oudijk, D. and I. Koper, *Het leven in een verpleeghuis. Landelijk overzicht van de leefsituatie, ervaren kwaliteit van leven en zorg van oudere verpleeghuisbewoners in 2019.* 2019, Sociaal Cultureel Planbureau: https://www.scp.nl/publicaties/publicaties/2021/02/19/het-leven-in-een-verpleeghuis.

2

The effect of garden use on quality of life and behavioral and psychological symptoms of dementia in people living with dementia in nursing homes: A systematic review

van der Velde-van Buuringen M, Hendriks-van der Sar R, Verbeek H, Achterberg WP, Caljouw MAA.
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ABSTRACT

Objectives: Considering the importance of going outside in a natural environment for people in general, and people living with dementia in particular, we want to unravel the aspects by which garden use affects quality of life (QoL) and behavioral and psychological symptoms of dementia (BPSD) in people living with dementia in nursing homes.

Design: Systematic review.

Setting and participants: People living with dementia in nursing homes.

Methods: This systematic review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Eight electronic bibliographic databases were searched (May 2022). Quantitative, qualitative and mixed-methods studies describing the effect of garden use on QoL, BPSD, or other outcomes related to QoL or BPSD in people living with dementia in nursing homes were included. The methodological quality of individual studies was assessed with the Mixed Methods Appraisal Tool (MMAT) and a narrative synthesis of the results was performed.

Results: After screening title and abstract (N = 498), and full-text assessment (N = 67), 19 publications were included. These described 17 studies and three types of interventions: (1) interventions regarding the evaluation of effects of specifically designed nursing home gardens, (2) participation of the people living with dementia in outside activities, and (3) other interventions, for example, garden visits and different seasons.

Conclusions and implications: Overall, first studies appear to suggest positive effects of garden use on QoL, BPSD, or other outcomes related to QoL or BPSD (stress, sleep, and mood) in people living with dementia in nursing homes. However, consensus regarding measurements and key outcomes, taking into account the physical, social, and organizational aspects when designing the garden use intervention, is necessary for the reliable evaluation of these interventions.

Systematic review registration: https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=283267, identifier: CRD42021283267.

INTRODUCTION

Dementia is categorized as a major neurocognitive disorder, and is an irreversible disorder with a progressive decline in various cognitive functions that influences intellectual, social and physical functioning.[1,2] Most of the people living with dementia in nursing homes spend their day inactive in a lying down or sitting position, and on average more than 90% of the residents stay inside their ward during the day.[3] They experience a major loss of quality of life (QoL), defined by "the multidimensional evaluation of the person-environment system of the individual, in terms of adaptation to the perceived consequences of the dementia". [4, 5] Some of the aspects that influence QoL are behavioral and psychological symptoms of dementia (BPSD), for example agitation.[2, 6] BPSD is defined as "signs and symptoms of disturbed perception, thought content, mood, and behavior".[6, 7] Possible causes of the symptoms are neurobiologically related disease factors, unmet needs such as hunger or pain, caregiver factors and environmental triggers.[7]

Various interventions have been developed to tackle the problems as mentioned above. One of these interventions is the passive and active use of gardens of nursing homes. [8] Garden use consists of a variety of activities, some individual, some communal. The definition of gardens and garden use differs widely in terms of scale, function, and activity.[9] Gardens are often thought of as intimate private spaces attached to private households but they can also be large private or formal gardens part of nursing homes.[9] There are different possibilities regarding the use of gardens in nursing homes, for example horticultural therapy, which uses plant-related activities as a therapeutic modality to achieve goals [10], or green care farms that combine agricultural with care activities.[11]

In this systematic review the term garden use refers to any activity in the nursing home garden that is a person-centered activity and fits within the usual activities in daily nursing home practice, meaning going outside into the nursing home garden and doing an activity outside that is usually done inside. Examples of person-centered garden activities are sitting, walking, having a conversation, drinking a beverage, having lunch, gardening, or receiving therapy.[12] Person-centered care is a care approach built around the needs of an individual. It recognizes that all people are unique and have their own personal needs. The task of the caregivers is to be aware of behaviors that undermine the person's wellbeing (and to do that as little as possible) and enhance the person's wellbeing (and to do that as much as possible) to deliver optimum levels of care. The activities are tailored to the residents' wishes and preferences.[13, 14]

Being in the garden can provide a physical and psychological distance from stress and attention evoking stimuli.[15] There are different theories about how being in a natural environment such as a garden can promote more rapid and complete restoration of (the consequences of) stress than other environments, but two contrasting theories dominate this field.[15] The psychoevolutionary theory places emphasis on stress reduction whereby contact with nature can very rapidly evoke positive affect, which in turn blocks negative thoughts and feelings and fosters reduction of physiological activation.[15–17] The attention restoration theory places emphasis on recovery of the capacity to focus attention, whereby effortless attention engaged by intrinsically interesting aspects of nature enables rest for a fatigued neurocognitive inhibitory mechanism engaged when willfully directing attention.[15, 18]

In recent years, interest in the effects of garden use on people living with dementia in nursing homes has increased. More and more studies from different disciplines are finding positive effects of different aspects of garden use. For example, one review suggested an overall positive effect of the creation of dementia-friendly gardens on agitation, apathy and engagement, despite concerns about the methodological approaches.[19] Another review examined the barriers and facilitators affecting nursing home residents' use of outdoor space, as perceived by residents, their family members, and staff.[20] This study showed that, in addition to specific aspects in the design of the garden, cultural change at an organizational level is also necessary, for example by addressing perceptions of safety. Whear et al. [21] showed promising results for the effect of garden use on agitation.

Despite the increasing number of studies on this topic, there is no systematic review done of recent specific data on the effect of garden use on QoL and BPSD in people living with dementia in nursing homes. Considering the importance of going outside in a natural environment for people in general [15], and people living with dementia in particular [21], we want to unravel which aspects of garden use affect QoL and BPSD in people living with dementia in nursing homes. This systematic review therefore addressed the following research question: "What is the effect of garden use on QoL and BPSD in people living with dementia in nursing homes?"

METHODS

This systematic review was conducted and reported following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. [22] The search and analysis methods were specified in advance in a protocol. The protocol is registered in the International Prospective Register of Systematic Reviews (PROSPERO; CRD42021283267).

Search strategy

The search strategy was developed together with an information specialist and included terms related to garden use, dementia, QoL, BPSD, and nursing homes. For the complete search strategy see the Supplementary material online attached to the electronic version of this paper. Searches were conducted in eight electronic bibliographic databases for the period 1946 to May 2022: PubMed, MEDLINE, Embase, Web of Science, COCHRANE Library, Emcare, PsycINFO, and Academic Search Premier. The search in the electronic bibliographic databases was conducted on May 12, 2022.

Eligibility criteria

Research articles describing the effect or measuring the effect of the intervention of garden use (outdoor spaces, outside, wander garden, therapeutic garden, and healing garden in the nursing home environment) on QoL (wellbeing and life quality), and BPSD (BPSD, neuropsychiatric symptoms of dementia) in people living with dementia in nursing homes (nursing homes by the definition of Sanford et al. [23] "A facility with a domestic-styled environment that provides 24-h functional support and care for people who require assistance with ADLs and who often have complex health needs and increased vulnerability," institutional care) were eligible for inclusion. In addition, quantitative, qualitative and mixed-methods studies in English/Dutch/German/French were eligible for inclusion. Letters to the editor, reviews, studies describing the effects of horticultural therapy, or taking place at facilities without 24-h functional care were excluded.

Study selection

Two researchers (MVB and RHS) independently assessed which studies retrieved in the searches met the inclusion criteria based on titles and abstracts. This was followed by full-text assessments. Differences were discussed until consensus was reached, and when necessary by consulting a third researcher (MAAC).

Methodological quality of individual studies

The Mixed Methods Appraisal Tool (MMAT) version 2018 [24] was used to assess the methodological quality of all included individual studies. One researcher (MVB) carried out the assessment, which was checked by a second researcher (RHS). Again, consensus was reached through discussion, and when necessary by consulting a third researcher (MAAC).

Data extraction and analysis

A standardized data extraction form was developed to extract the data of the included studies. A description of the included studies was summarized in a table by extraction of year and country of publication, study design, study population,

intervention, outcome measures, and study quality (MMAT). Studies were not excluded from the review based on their quality.

Included studies were anticipated to be very diverse in terms of intervention and outcome measures, making pooling impossible. Therefore, a narrative synthesis of the findings was given in a table structured by outcome (study design, participants, type of intervention, QoL, BPSD, other outcomes related to QoL or BPSD, and methodological quality) and description of the aim/objective of the study and main findings. This synthesis was carried out by two researchers (MVB and RHS), and a third author (MAAC) was available if agreement was not reached.

RESULTS

Study selection

The process of screening and selection is shown in the flow diagram in **Figure 1**. After removal of duplicates, 498 publications remained. After screening title and abstract on inclusion criteria, 431 publications were excluded. The remaining 67 publications were screened full text, after which 31 publications were excluded. The remaining 36 publications were assessed for eligibility and finally 19 publications were included in this review.

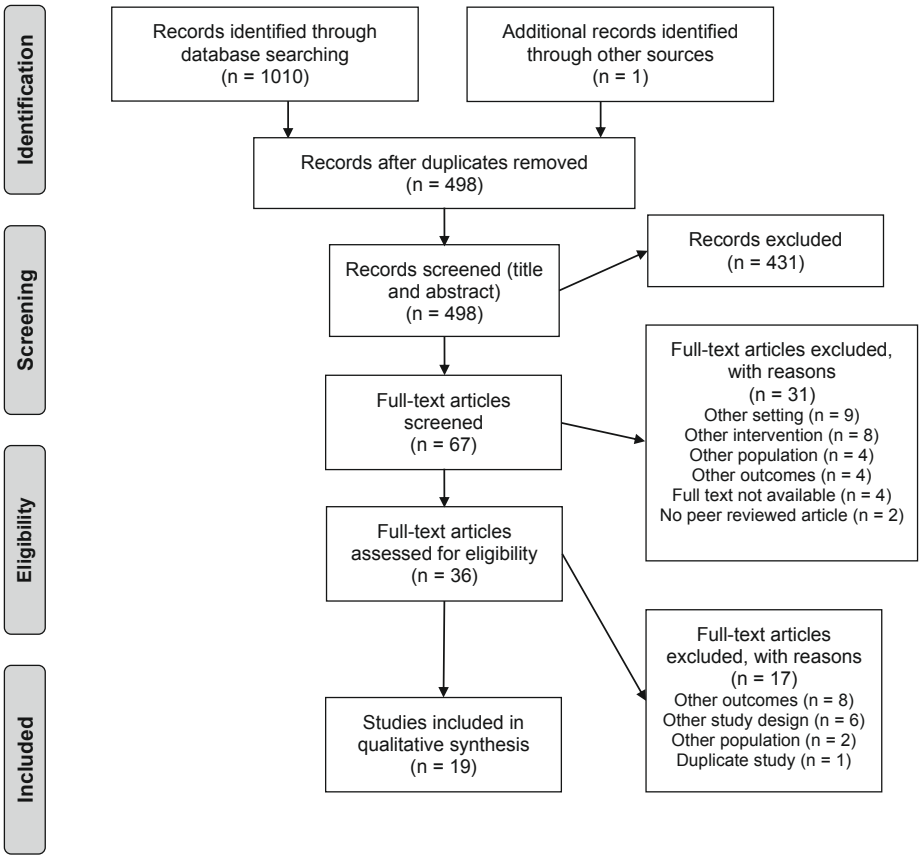

Figure 1. *Flow diagram of the study screening and selection*

Study characteristics

The 19 publications included in this review described 17 different studies. The publications of Detweiler et al. [25], Detweiler et al. [26], and Murphy et al. [27] reported on different aspects of the results of the same study. The characteristics of the included studies are presented in **Table 1**.

Table 1. *Description of included publications (N = 19)*

Reference		Methods		Outcome measures			Quality
Publication (Country)	**Study design**	**Participants**	**Intervention**	**QoL**	**BPSD**	**Other**	**MMAT score (%)**
Bourdon et al., 2021 (FR)	Non-randomized cluster-controlled trial (Pilot study)	*n* = 120 PWD* (39 PWD control group; 41 PWD conventional sensory garden group; 40 PWD enriched garden group; no significant differences in characteristics between groups)	-PWD were assigned to one of 3 groups based on the location of their room and its proximity to one of the two gardens: (1) close to conventional sensory garden, (2) close to enriched garden, (3) neither. -Staff encouraged PWD assigned to the conventional sensory garden group and the enriched garden group to visit their respective gardens at least 4 times a week. Usual care for control group. -6 Months during spring and summer.	-	-	-Independence for activities of daily living: ADL[4] -Risk of falls: Unipodal stance and TUG[5] -All measurements rated by two observers (a psychologist and an occupational therapist) who were independent of the research team)	80
Calkins et al., 2007 (USA)	Before-and-after study; Non-randomized study	*n* = 17 PWD (15 females, 2 males; MMSE *M* = 10.5) *n* = 32 staff members (30 females, 2 males)	-4 Conditions: A) winter/no activity B) winter/inside activity C) summer/no activity D) summer/outside activity -Activity minimum of 30 minutes -Data collection A and C 1 week, B and D 2 weeks.	-	CMAI(rated by day and evening shift staff members, research assistant)[||]	-Sleep: Actilume-L devices (movement and light); PSQ(rated by night shift staff members)** -Mood: Facial Affect Rating Scale (rated by research assistant)	100
Cohen-Mansfield, 2007 (USA)	Non-comparative study; Quantitative descriptive study	*n* = 320 staff members of facilities (66% directors, 13% administrators, 16% other position, 6% not specified)	National survey in long-term care facilities with outdoor areas investigating the characteristics and features of these areas and how they relate to their perceived impact on their users.	-	-	Experience with outdoor area: Survey (with staff members)	80
Connell et al., 2007 (USA)	Quantitative randomized controlled trial (Pilot study)	*n* = 20 PWD (1 female, 19 males; Age range 64 – 90; Outdoor MMSE *M* = 11.7; Indoor MMSE *M*: 18.9 (Difference *p* = .05))	-Two groups: Outdoor activity program in existing outdoor space vs indoor activity program in existing activity space. -Activity same for both groups, namely with horticultural focus. -Duration of 10 days, with 1 hour activity. -Data collected at baseline (10 days) and during intervention (10 days)	-	CMAI (rated by primary care staff members who were interviewed by researchteam)	Sleep: Wrist actigraphs with photocells	60

Table 1. *Continued*

Reference		Methods		Outcome measures			Quality
Publication (Country)	**Study design**	**Participants**	**Intervention**	**QoL**	**BPSD**	**Other**	**MMAT score (%)**
Cox et al., 2004 (AU)	Mixed- methods study	Quantitative part: *n* = 24 PWD (23 females, 1 male; 29% Resolution Stage 3; 38% Stage 2; 33% Stage 1) Qualitative part: *n* = 12 staff members and relatives	Quantitative part: -Each participant experienced each of the three activities (living room, garden, Snoezelen room) accompanied by a caregiver during 3 individual 16-minute sessions, thus with total of 9 sessions per resident. -One session a day between 10:00-15:00 hrs Qualitative part: Both groups were asked the same set of questions (own responses to environment, their impressions of residents' responses to environment, aspects of environments which were enjoyed by themselves or the residents)	-	-	Quantitative part: -ARS(rated by two trained observers)[††] Qualitative part: -Interview with open -ended questions (with staff members and relatives)	20
Detweiler, 2009 (USA) Used data from Detweiler et al., 2008 (USA)	Before-and-after study; Non-randomized study	*n* = 28 PWD (28 males; Age *M* = 80.5; Ambulation category = 17 ambulatory, 2 merry walker, 9 wheelchair)	-Baseline year: 1 year of observations at the closed dementia unit without a wander garden. -Observation year: 1 year of observations at the closed dementia unit (after adding a wander garden) with a wander garden.	-	Number of falls: Fall severity score based on the Institutional Fall Committee ratings (obtained by researcher) -Scheduled psychiatric medications (obtained by researcher)	-	80
Detweiler et al., 2008 (USA)	Before-and-after study; Non-randomized study	Baseline year: *n* = 34 PWD (34 males; Age *M* = 80.71; Ambulation category = 21 ambulatory, 2 merry walker, 11 wheelchair) Observation year: *n* = 29 PWD (due to mortality) *n* = 42 staff members and relatives	-Baseline year: 1 year observations at the closed dementia unit without a wander garden. -Observation year: 1 year observations at the closed dementia unit with a wander garden.	-	-CMAI (rated by the same team member, who saw all patients every day for multiple hours of activity) -Incident reports (level 1 least serious to 4 most serious) (obtained by researcher) -PRN[‡‡] medications (obtained by researcher) -Survey (with staff and family)	-	80

Table 1. *Continued*

Reference		Methods		Outcome measures			Quality
Publication (Country)	**Study design**	**Participants**	**Intervention**	**QoL**	**BPSD**	**Other**	**MMAT score (%)**
Dyer et al., 2021 (AU)	Non-comparative study; Quantitative descriptive study	*n* = 541 residents (348 PWD (64.3%); 453 PWD or PAS-Cog[§§] ≥ 5 (83.7%); 403 Females (74.5%); Age *M* = 85.5)	Survey at nursing homes with and without independent access to outdoor spaces.	HR-QoL[‖‖] assessed with EQ-5D-5L (rated by the residents where possible, or a proxy family member where necessary)***	-	-	100
Edwards et al., 2013 (AU)	Mixed- methods study	*n* = 10 PWD (9 females, 1 male; 4 PW severe D; 3 PW moderate D; 3 PW mild D; Age range = 79-90)	-Evaluation of effects of a therapeutic garden designed specifically for PWD on the basis of results of literature review to increase QoL. -Measurements 3 months prior to new garden and 3 months post new garden construction. -Pre: Log sheets and observations over a 12-day period in autumn with frequency use old garden by residents, staff and visitors. -Post: Log sheets and observations over a 12-day period in following spring with frequency use new garden by residents, staff and visitors, in same weather conditions.	DEMQOL(Proxy) (If the resident was assessed according to the MMSE as having mild dementia they completed it themselves with a trained staff member assisting, otherwise a family member assessed it with the assistance of a staff member trained in the administration.) [†††]	CMAI (rated by trained staff members)	-Depression: SCDD (rated by trained staff members)[‡‡‡] -Open-ended questions interview (with staff members and family)	20
Evans et al., 2019 (UK)	Mixed- methods study	Online survey: *n* = 144 survey responses (Average of 40.6% PWD: 50% extra care housing; 25% residential care homes; 13% nursing care homes; 3% retirement villages; 1% continuing care schemes; 8% unknown) Interviews: *n* = 19 residents (7 extra care housing; 12 care home) *n* = 16 staff members (7 extra care housing; 9 care home)	-Following a review of literature, an online survey was developed (demographics; current green dementia care experiences and activities; barriers and enablers to providing green dementia care; perceived impacts of green dementia care). -In depth-case study research was carried out at 3 care homes and 3 extra care housing schemes (examples of good practice). Interviews were conducted.	-Online survey: "Perceived impacts of green dementia care" (with staff members)	-	-Online survey: "Perceived impacts of green dementia care" (with staff members) -Interviews (with residents and staff members)	20

Table 1. *Continued*

Reference		Methods		Outcome measures			Quality
Publication (Country)	**Study design**	**Participants**	**Intervention**	**QoL**	**BPSD**	**Other**	**MMAT score (%)**
Goto et al., 2018 (JP)	Before-and-after study; Non-randomized study	*n* = 32 PWD (16 hospital and 16 nursing home; 28 females, 4 males; 8 PW severe D; 14 PW moderate D; 8 PW mild D; 2 Unknown; Care-need level of 1-5 according to standard of Ministry of Health of Japan; Age *M* = 91; MMSE *M* = 12; No significant difference in average age, MMSE score, lifestyle and education between the 2 sites)	-Construction of 2 Japanese gardens; Hospital garden and Terrace (nursing home) garden. -Test 1 (T1) was conducted in 2 weeks prior to construction of garden (April). -Test 2 (T2) was conducted in 2 weeks post construction of garden (June). -Test 3 (T3) was identical to T2, except that the subjects faced the gardens with the glass doors closed (October). -For all tests, subjects were escorted to view the garden together with caregiver and researcher for 15 minutes, 2 times per week at approximately the same time during daytime hours.	-	-	-Physiological stress: Heart rate -Behavior: Behavioral Assessment Check List (rated by researcher and primary care staff member)	80
Hendriks et al., 2016 (NL)	Qualitative study	Focus groups: *n* = 34 PWD (25 females, 9 males; Age *M* = 81.22; 10 Nursing Home, 11 meeting center, 13 daycare center) Pilot study decision tool: *n* = 13 PWD with one or more behavior or mood problems (based on NPI-Q[§§§]) (7 females, 6 males; Age *M* = 78.09; 4 PWD from Nursing home (5 meeting center, 4 day care))	Focus group study -An executed review was input for a discussion guide regarding experiences and activities in nature that was applied in the focus group study. -Focus group lasted approximately 1 hour Pilot study of a decision tool for personalized nature activities - Based on the outcomes of the decision tool PWD were assigned to 1 of 3 designed example activities (nature walk, gardening, and sensory activation in nature). -All activities were personalized -All activities were in a group context. -PWD from NH only participated in the nature walk (day care gardening; meeting center gardening and nature walks) -Executed during spring	-Themes of focus group interviews were categorized into QoL domains (Droes et al (2006)) (with residents) -Semi-structured interviews focusing on their experience of and satisfaction with the activity (with residents)	-	Mood: OERS[|||||] and the Interact instrument (rated by the researchers)	100

Table 1. *Continued*

Reference		Methods		Outcome measures			Quality
Publication (Country)	**Study design**	**Participants**	**Intervention**	**QoL**	**BPSD**	**Other**	**MMAT score (%)**
Hernandez, 2007 (USA)	Mixed- methods study	Interviews: *n* = 40 staff members and relatives Observations: *n* = 59-79 PWD	-Effects of "therapeutic garden" concept -Post occupancy evaluation after installation of 2 gardens: Garden View and Sunshine Center -Interviews with staff and families of 20-45 minutes about behavior -Observations during common as well as uncommon hours from 6- to 8-hour blocks of time until saturation was achieved.	-Behavior: Interviews (with staff members and relatives)	-	-Behavior: Interviews (with staff members and relatives) -Emotional reactions: AARS (rated by the researcher)****	0
Liao et al., 2020 (USA)	Mixed- methods study (Pilot study)	*n* = 42 staff members (42 females; 35 free garden use group; 7 unfree garden use group)	Pilot study evaluating the effects of garden visits on outcome measures via semi- structured questionnaires.	-	Semi-structured questionnaire (with staff members)	Semi-structured questionnaire (with staff members)	20
Mather et al., 1997 (CA)	Before-and-after study; Non-randomized study	*n* = 10 PWD (7 females, 3 males; Age *M* = 83)	-Pre-post comparison of garden access across the summer period. In the winter access was limited due to cold and snow. -Garden was constructed a year prior to start of study. -Measurements were done for periods of 1 week pre-, mid-, and post-summer.	-	Baumgarten, Becker and Gauthier's checklist, modified (rated by trained staff members)	Baumgarten, Becker and Gauthier's checklist, modified (rated by trained staff members)	50
Motealleh et al., 2022 (AU)	Mixed- methods study (Case study)	Quantitative part: *n* = 10 PWD (9 females, 1 male; Age *M* = 81.7; 2 mild impairment (PAS score); 6 moderate; 2 severe) Qualitative part: *n* = 10 PWD (9 females, 1 male; Age *M* = 81.7; 2 mild impairment (PAS score); 6 moderate; 2 severe) *n* = 10 staff members	Quantitative part: -Improving garden based on dementia-friendly environment (DFE) characteristics -Researcher accompanied each participant from their bedroom into the improved garden -4-week intervention with daily (Monday-Friday) 60-minute session Qualitative part: -Post-intervention individual semi-structured interviews with PWD and staff members to understand perceptions of the improved garden; and with staff members to determine their views on the effect of the improved garden on PWD	-	-CMAI-SF (rated by primary care staff members) -PEAR (rated by the researcher)††††	-Engagement: EPWDS (rated by the researcher)††††	100

Table 1. *Continued*

Reference		Methods		Outcome measures			Quality
Publication (Country)	**Study design**	**Participants**	**Intervention**	**QoL**	**BPSD**	**Other**	**MMAT score (%)**
Murphy et al., 2010 (USA) Used data from Detweiler et al., 2008 (USA)	Before-and-after study; Non-randomized study	Baseline year: *n* = 34 PWD (34 males; Age *M* = 80.71; Ambulation category = 21 ambulatory, 2 merry walker, 11 wheelchair) Observation year: *n* = 29 PWD (due to mortality)	-Baseline year: 1 year observations at the closed dementia unit without a wander garden. -Observation year: 1 year observations at the closed dementia unit with a wander garden.	-	CMAI (rated by the same team member, who saw all patients every day for multiple hours of activity)	-	80
van der Velde-van Buuringen et al., 2020 (NL)	Mixed- methods study (Feasibility study)	Quantitative part: *n* = 20 PWD (13 females, 7 males; Age *M* = 85.2; GDS§§§§ 5-7) Qualitative part: Caregivers, psychologist, elderly care physician, occupational therapist, physiotherapist, registered nurse, managers.	-Garden-use intervention consisting of going outside for at least 30 minutes in the nursing home garden, for any person-centered activity that fits within the usual activities in daily nursing home practice. - The study lasted eight weeks; the first two weeks were the baseline period (no instructions), between weeks three and four the intervention was implemented (researcher helped the caregivers, who were the primary coordinators of the intervention, to start planning the execution of the intervention), weeks five and six were the intervention period and final measurements were carried out at the end of week eight. During the follow-up period (weeks 7-8) the wards received no instructions or suggestions.	QUALIDEM (rated by primary care staff members, assisted by the researcher)	NPI-NH (rated by primary care staff members, assisted by the researcher)	Interviews and questionnaires about process of and experience with intervention (with staff members)	20
White et al., 2018 (UK)	Before-and-after study; Non-randomized study	*n* = 28 PWD (Mid- to late-stage dementia)	-Carer-mediated exposure to a nature-rich garden (following previously established guidelines on design).	-	-	Mood: Carer-assessed score on a scale of 1-3, representing poor, medium and good, respectively (rated by primary care staff members)	60

Table 1. *Continued*

*	People living With Dementia
†	Activities of Daily Living
§	Timed Up and Go
‖	Cohen-Mansfield Agitation Inventory (-Short Form)
**	Pittsburgh Sleep Quality Index
††	Affect Rating Scale
‡‡	Pro re nata
§§	Psychogeriatric Assessment Scale Cognitive Impairment Scale
‖‖	Health-related QoL
***	EuroQoL instrument
†††	Dementia Quality of Life Instrument
‡‡‡	Cornell Scale for Depression in Dementia
§§§	Neuropsychiatric Inventory (-Nursing Homes)
‖‖‖	Observed Emotion Rating Scale
****	Apparent Affect Rating Scale
††††	Person-Environment Apathy Rating Scale
‡‡‡‡	Engagement of a Person with Dementia Scale
§§§§	Reisberg Global Deterioration Scale

Study design

Seven publications used a before-and-after non-randomized design [25–27, 36, 41, 43], and seven had a mixed-methods design [12, 32, 34, 35, 39, 40, 42]. A non-comparative quantitative descriptive study design was used in two publications [33], one used a quantitative randomized controlled trial design [31], one was a non-randomized clustered controlled trial [28], and one had a qualitative study design [37]. Four studies were pilot or feasibility studies [12, 28, 31, 40].

Participants

The number of participants included in the publications ranged from 10 people living with dementia [34, 41] to 541 residents (of whom 453 people living with dementia (83.7%) or a score of ≥ 5 on the Psychogeriatric Assessment Scale Cognitive Impairment Scale (PAS-Cog)) [33]. Ten publications included only people living with dementia as participants [25, 27, 28, 31, 33, 34, 36, 37, 41, 43], while seven included people living with dementia as well as staff members and relatives as participants [12, 26, 29, 32, 35, 39, 42], and two only included staff members as participants [30, 40].

Interventions

A wide variety of interventions are described. They can be grouped into interventions regarding the evaluation of (1) effects of specifically designed nursing home gardens, (2) participation of the people living with dementia in activities in the garden of the nursing home, and (3) other interventions. Eight studies described an evaluation of the effects of specifically designed gardens [25–28, 34, 36, 39, 42], three regarded interventions in which the people living with dementia participated in activities that took place in different environments, for example, the

garden vs. the living room [29, 31, 32], and the rest of the publications described a range of other interventions, like an evaluation of the effects of garden visits [40, 43], garden visits in different seasons [29, 41], of (not) having independent access to the outdoor spaces [33], and creating and testing a decision tool for personalized nature activities [37]. Furthermore (a number of), sessions were part of the intervention in only three publications [32, 36, 42].

Outcome measures

Overall, there was a wide variety in outcome measures. The results of the publications were divided based on outcome: QoL, BPSD, and other outcomes related to QoL or BPSD (see **Table 1**). The outcome QoL was measured both quantitatively [12, 33, 34, 39], and qualitatively [35, 37, 39]. The measurements of BPSD showed the most homogeneity: eight of the 10 publications used quantitative measures, of which six the Cohen-Mansfield Agitation Inventory (-Short Form; CMAI (-SF)) [26, 27, 29, 31, 34, 42]. Other measurements used were the number of falls, number of incidents, scheduled and pro re nata psychiatric medications, the modified Baumgarten, Becker and Gauthier's checklist, the Person-Environment Apathy Rating Scale (PEAR), and the Neuropsychiatric Inventory Nursing Homes (NPI-NH) [12, 25, 26, 41, 42]. Only three publications (also) used qualitative measures, namely a survey, a semi-structured questionnaire, and a semi-structured interview [26, 40, 42]. Other quantitative QoL- or BPSD-related outcome measures used were, for example, heart rate (stress), wrist actigraphy with photocells (sleep), and the Cornell Scale for Depression in Dementia (SCDD; depression). The qualitative outcome measures consisted mostly of (semi-structured) questionnaires or surveys. Due to the considerable heterogeneity of the used measures, it is very difficult to compare the effectiveness of the different interventions.

Methodological quality of individual publications

The results of the assessment of the methodological quality of individual publications are presented in **Table 1**. The overall MMAT score ranged from 0% [39] to 100% [29, 33, 37, 42]. Of the 19 publications, one scored 0% [39], five scored 20% [12, 32, 34, 35, 40], and 13 scored 50% or higher. Most of the studies using mixed methods made insufficient use of the potential of this type of design. For example, they did not describe if and how the different components of the study were effectively integrated to answer the research question, nor did they adequately address the divergences and inconsistencies between quantitative and qualitative results. Overall, however, the independent quantitative and qualitative components of these studies were of good quality.

Results of individual studies

Quality of life

The results regarding QoL are summarized in **Table 2**. All six publications described a positive effect of garden use on QoL in people living with dementia in nursing homes [12, 33–35, 37, 39]. Some publications show an overall positive effect of garden use on QoL [34, 39]. Others found a more specific positive effect on QoL. Van der Velde-van Buuringen et al. [12] for example, found that people living with dementia showed an increase in the domain positive affect and a decrease in the domain social isolation of the QUALIDEM during the intervention period of going outside. Another example is the study by Dyer et al. [33] which found that going outdoors daily was significantly associated with better Health-related QoL (HR-QoL) of residents. However, going outdoors multiple times (1–6 times) per week but not daily was not significantly associated with better HR-QoL. Based on focus group interviews Hendriks et al. [37] found eight key themes concerning the question what kind of experiences persons living with dementia find important for their wellbeing and QoL when in nature: Pleasure, relaxation, feeling fit, enjoying the beauty of nature, feeling free, the social aspect of nature, feeling useful, and memories. In Evans et al. [35] staff members mentioned many ways in which they felt nature-based activities had a positive effect on the wellbeing of persons living with dementia, including high levels of engagement, a sense of freedom, creativity, increased social interaction, inter-generational contact with families, and the calming effect of contact with animals. Of the five publications with qualitative data [12, 33, 35, 37, 39], only two [35, 37] publications (also) asked the people living with dementia directly about their experiences, instead of only staff members and/or relatives on the behalf of the people living with dementia. Three [12, 35, 37] of the publications were suitable for further in-depth data synthesis. In these papers, five themes were identified that appear to capture the overall experiences of people living with dementia, staff members, and relatives of the effect of garden use on QoL: sense of freedom [35, 37], social interaction [35, 37], calming effect [12, 35, 37], reminiscence [12, 37], and pleasure [35, 37].

Table 2. *Main findings on outcome measure QoL (n = 6)*

Outcome	Reference	Aim/objective	Main findings
QoL	Dyer et al., 2021	"To examine the association between provision of independent access to outdoor areas at the nursing home level and actual use of outdoor areas by the residents with HR-QoL in a population of residents of Australian nursing homes with a high prevalence of dementia."	-Going outdoors daily was significantly associated with better HR-QoL of residents. -However, going outdoors multiple times (1-6 times) per week but not daily was not. -Living in a NH with independent access to outdoor was also not significantly associated with better HR-QoL of residents. -Simply providing independent access to outdoor areas is insufficient to achieve HR-QoL benefits for residents in nursing homes; there is a need to enable and support regular use of outdoor spaces.
	Edwards et al., 2013	"To evaluate whether a therapeutic garden can improve the quality of life of aged care residents with dementia and their carers."	-Significant improvements in QoL of residents after creation and use of therapeutic garden. -Staff, family and resident interviews elicited consistently positive feedback concerning the new garden, including observations that it had improved the QoL of the residents.
	Evans et al., 2019	"To report on a project that aimed to explore the opportunities, benefits, barriers and enablers to interaction with nature for people living with dementia in residential care and extra care housing schemes in the UK."	-Staff also mentioned many ways in which they felt nature-based activities had a positive effect on wellbeing of PWD, namely high levels of engagement, a sense of freedom, creativity, increased social interaction, inter-generational contact with families, and the calming effect of contact with animals.
	Hendriks et al., 2016	"To develop an approach, including examples of personalizable nature activities and a decision tool to design personalized nature activities for people with dementia, and to try this out among people with behavior and mood disruptions. Which aspects of being in nature or outdoor spaces do people with dementia find important for their quality of life?"	-Concerning the question what kind of experiences PWD find important for their well-being and QoL when in nature, 8 key themes emerged: Pleasure, relaxation, feeling fit, enjoying the beauty of nature, feeling free, the social aspect of nature, feeling useful, and memories.
	Hernandez, 2007	"What effect does the garden design have on the QoL of residents living in special care units for people with dementia?"	-Value was placed on the garden (or outdoor space) as a therapeutic tool for enhancing life quality.
	van der Velde-van Buuringen et al., 2020	"To evaluate the process (usefulness, feasibility, applicability) of going outside daily in a nursing home garden and to explore the effect of garden use on QoL and neuropsychiatric symptoms in persons with advanced dementia."	-PWD showed an increase in the domain positive affect and a decrease in the domain social isolation of the QUALIDEM* during the intervention period of going outside. -No significant differences were found for the other domains of QoL. -The intervention was observed to be positive for the people living with dementia in terms of improved reminiscence, less agitated behavior, a new positive habit and being more awake during the day.

* Dementia Quality of Life Instrument

Behavioral and psychological symptoms of dementia

The results regarding BPSD are summarized in **Table 3**. Seven of the 10 publications describe positive effects of garden use on BPSD [25–27, 31, 34, 40, 42]. Some publications describe an overall positive effect on BPSD [26, 33], others a more specific effect, for example on the frequency of verbal agitation [31]. Murphy et al. [27] showed that the degree to which the average numbers of days spent in the wander garden is associated with decreased agitation scores is dependent on baseline agitation scores and ambulation ability. There was more effect for the people living with dementia who had higher levels of agitation at the beginning of the study than for those who had lower levels of agitation. Also, when residents could walk without assistance, a low, medium and high usage of the garden reduced agitation, with a higher frequency corresponding with a greater decrease in agitation. For the merry walker chair and wheelchair users, those who had a high number of garden visits showed decreased agitation levels, but medium or low garden usage was associated with unchanged or increased agitation. Detweiler et al. [25] found variations in effects of low or high frequency garden use. The high frequency garden use group showed a decreased need for scheduled high-dose and intermediate-dose antipsychotics, eliminated and reduced the need for scheduled secondary antidepressants, and scheduled intermediate-dose hypnotics compared to the low frequency garden use group. Also, increased garden use appeared to be related to a decreased frequency and severity of falls. The rest of the publications showed no significant positive effects, or inconclusive or contradictory effects of garden use on BPSD [12, 29, 41, 42]. Both van der Velde-van Buuringen et al. [12] and Motealleh et al. [42] found no significant differences in the quantitative data measured with the NPI-NH and CMAI, but when conducting semi-structured interviews with people living with dementia and staff members, reduced agitated behavior was mentioned as one of the positive results of garden use. Calkins et al. [29] found changes that were contradictory, namely fewer resident-requests for attention during the day as observed by the research assistant, but more requests for attention in the evening as observed by the evening shift staff members. An explanation given by the researcher is that because the people living with dementia are sleeping better, they don't want to go to bed as early and therefore request attention. Liao et al. [40] showed that garden visits had positive effects on behavioral problems, through multisensory stimulation, a feeling of independence, provoking a recall of memories, and relieving stress. Of the three publications with qualitative data [12, 40, 42], only one publication [42] (also) asked the people living with dementia directly about their experiences, instead of only staff members on the behalf of the people living with dementia. All three of the publications were suitable for further in-depth data synthesis, whereby one theme was identified: Garden use had a positive effect on agitation [12, 40, 42].

Table 3. *Main findings on outcome measure BPSD (n = 10)*

Outcome	Reference	Aim/objective	Main findings
BPSD	Calkins et al., 2007	"To examine the impact of increased time spent outdoors on sleep and agitation in individuals with dementia residing in nursing homes and to explore a variety of methodological issues in preparation for a larger study."	-Several smaller but positive behavioral changes (less grabbing and fewer strange noises). -A few changes that are contradictory (fewer resident requests for attention during the day, but more requests for attention in the evening)
	Connell et al., 2007	"A two-phase (baseline, intervention), two-group (outdoor activity program, indoor activity program) design was used to obtain preliminary data on the effect of bright light exposure during participation in a structured activity program on sleep and behavior disturbance in nursing home residents with dementia."	-Outdoor group: Significant decline in frequency of verbal agitation. Aggression and physical agitation decline, but not significant. Indoor group no significant change.
	Detweiler et al., 2008	"To explore the effect on inappropriate behaviors of adding a wander garden to an existing dementia unit. The objective of the observational study was to assess the long-term impact of the wander garden on resident-inappropriate behaviors, incidents, and as needed medications in the effort to ultimately improve their quality of life."	-A medium-high effect of the wander garden on CMAI scores and a reduced need for PRNs. -Results of the survey of both family and staff regarding the influence of the wander garden on agitation, mood, and QoL were positive. -The staff also agreed that the wander garden improved their QoL. -Th effect of the wander garden on incident reports was inconclusive.
	Detweiler, 2009	"If exposure to the wander garden decreases agitation, would there be a reduction in scheduled psychiatric medications? Second, would a reduction in PRN use, perhaps complemented by a reduction in scheduled psychotropic medications, contribute to fewer falls?"	-Increased visitation of garden appears to be related to decreased severity of falls, 30% decrease in number of falls during observation year despite dementia progression. -It appears that a garden may contribute to the wellbeing of different PWD in different ways: For ambulatory residents, agitation levels were reduced (see Detweiler et al., 2008). However there was not much change in falls. For residents using wheelchairs, the impact of the garden on agitation levels was smaller, but there was a significant fall reduction.
	Edwards et al., 2013	"To evaluate whether a therapeutic garden can improve the quality of life of aged care residents with dementia and their carers."	-Significant improvements in agitation of residents after creation and use of therapeutic garden.
	Liao et al., 2020	"To evaluate the effects of garden visits on mood, social interaction, cognition, and behavioral problems and to determine what type of behavioral problems and cognitive abilities among patients with dementia may be improved after visiting a garden."	-Among the evaluated behavioral problems, staff reported that garden visits reduced residents' depression, anxiety/agitation, and aggression/anger significantly more than other behavioral problems. -Staff members in the free garden use group reported that the effects of garden visits on improving residents' aggression/anger, and anxiety/agitation were significantly better than those in the unfree garden group -Garden visits had positive effects on behavioral problems, through multisensory stimulation, a feeling of independence, provoking a recall of memories, and relieving of stress.

Table 3. *Continued*

Outcome	Reference	Aim/objective	Main findings
	Mather et al., 1997	"To assess the benefit a specialized service such as the garden would give to severe Alzheimer patients."	-No significant differences found on disruptive behavior across 3 shifts and 3 time periods. -Having access to the outdoors did not decrease aggression. -Residents who showed the greatest changes over the observation period were those who used the garden the most. They showed less overall disruptive behaviors when compared to infrequent users of the garden.
	Motealleh et al., 2022	"To investigate the effect of a garden improved according to the dementia-friendly environment (DFE) characteristics on agitation, apathy, and engagement of people with dementia in one residential aged care facility."	-No significant improvement on agitation in quantitative data. -Qualitative findings indicated effectiveness of the garden in reducing agitation and restlessness of several PWD. -Apathy was lower during intervention, compared to baseline.
	Murphy et al., 2010	"To reevaluate the findings of the study of Detweiler et al. (2008). What is the effect of visiting the wander garden on the agitation scores of elderly dementia patients? Does the effect vary from person to person? If so, can an individual's ambulation category help explain the variability?"	-In general, a high average number of days spent in the wander garden is associated with decreased agitation scores. -There is more impact for the PWD who had higher levels of agitation at the beginning than for those who had lower levels of agitation. -Voluntary wander garden visits significantly lower agitation levels for ambulatory PWD; however, for the merry walker and wheelchair users there was virtually no change in CMAI scores over the course of the study. -Visiting the wander garden is useful in reducing agitation level, but the rate of change depends on ambulation ability. -When residents can walk without assistance, a low, medium and high usage of the garden reduces agitation: the higher the frequency the greater the decrease in agitation. -For the merry walker and wheelchair users, those who had a high number of garden visits had decreased agitation levels, but medium or low garden usage was associated with unchanged or increased agitation.
	van der Velde-van Buuringen et al., 2020	"To evaluate the process (usefulness, feasibility, applicability) of going outside daily in a nursing home garden and to explore the effect of garden use on QoL and neuropsychiatric symptoms in persons with advanced dementia."	-No significant differences were found for the participants' total and cluster scores on the NPI-NH -The intervention was observed by the caregivers to be positive for the people living with dementia through less agitated behavior.

Other outcomes related to QoL or BPSD

Other outcomes related to QoL or BPSD included stress, sleep, and mood (see **Table 1**). Regarding stress, Goto et al. [36] showed that when residents observed a Japanese garden with the door open, their physiological stress was relieved, as reflected in a sustained drop in the pulse rate of the residents. The blunting of the effect when the viewing was through a glass door hints at the importance of the sense of immersion in the scene. A number of publications found positive, but also contradictory effects of garden use on sleep. For example, the study by Connell et al. [31] showed no significant change in number of wakes when comparing an outdoor and indoor group during an intervention study. By contrast, Mather et al. [41] found that residents who used the garden often showed less sleep disruption when compared to infrequent users of the garden. Lastly, most of the publications showed an overall positive effect of garden use on mood [32, 34, 35, 40, 43]. White et al. [43] found a more specific time-dependent effect on mood, namely time spent outside was a non-linear predictor of change in mood score. Marked improvements in mood were associated with outdoor time of only 20 min duration and the greatest benefits were associated with an outdoor time of 80–90 min duration. After this point, the extent of positive change in mood score declined with more time spent outside.

DISCUSSION

Overall, the results of the included studies suggested positive effects of garden use on QoL, BPSD, and other outcomes related to QoL or BPSD in people living with dementia in nursing homes. All six publications regarding QoL described positive effects of garden use on QoL in people living with dementia in nursing homes. Two thirds of the publications regarding BPSD described positive effects of garden use on BPSD in people living with dementia in nursing homes, and one third showed no significant positive, inconclusive, or contradictory effects.

Some of the publications describe an overall positive effect on QoL and BPSD, while others show a more specific effect. Perhaps there are different mechanisms that affect the influence of garden use on QoL and BPSD. For example, Hartig et al. [15] present a framework of pathways (and possibilities for effect modification by individual or contextual variables) through which the natural environment might affect the health of broad segments of the populations. The framework shows that there are direct beneficial effects of nature on stress and indirect beneficial effects, through contact with nature, on physical activity and social contacts and therefore also on health and wellbeing.[15]

This systematic review found that studies examining the effect of garden use on QoL and BPSD in people living with dementia in nursing homes mostly focused on the evaluation of effects of specifically designed gardens. However, the question

is whether an intervention of specifically designed nursing home gardens for people living with dementia is sufficient and adequate, or does the complex care environment of nursing homes need a more complex intervention that includes the social and organizational aspects.[44–46] The theoretical framework in de Boer et al. [45] states that the literature indicates three environmental components within residential dementia care settings that impact everyday life and functioning of persons living with dementia: Physical aspects (e.g., design), social aspects (e.g., interactions with staff), and organizational aspects (e.g., attitudes that guide behavior of staff). There are barriers to garden use by people living with dementia in nursing homes, which may negatively influence the frequency of garden use, and therefore also negatively influence QoL and BPSD.[20] For example, apart from the design of the garden, one of the main barriers is the perceived risk of independent use of the outdoor space, resulting in for example locked doors.[20]

A limitation of this systematic review is that pooling and meta-analysis of the results of the interventions were not possible due to the use of different methods, interventions, and outcome measures in the individual studies. Overall, the majority of the studies did not describe the interventions in sufficient detail to be able to repeat the study, and very few publications provided effect sizes in the results. Whear et al. [21] discussed this problem and suggested that research in this field may benefit from an agreed set of tools to measure key outcomes, such as QoL, agitation, use of medication, or falls. However, measuring the possible effects of interventions on the daily lives of people living with dementia is difficult, because daily life is a dynamic and multidimensional concept. It involves more than just activities, for example the physical and social environments of the nursing homes.[47] Future research regarding the effects of garden use on people living with dementia in nursing homes could benefit from the development of such measures that incorporate the context of the physical and social environments of the nursing homes.

Given the positive effects of garden use on QoL and BPSD in people living with dementia in nursing homes, one might expect that garden use is already incorporated in daily nursing home practice. This is, however, not the case, as demonstrated by the low numbers of people living with dementia who go outside. [3] It is important to recognize that current interventions regarding garden use with a focus on changing the physical aspects in the garden environment might not be sufficient to solve this problem. Future research should focus on including all aspects (i.e., physical, social, and organizational) in the garden use intervention, for example by providing training and activities to empower staff to implement garden use in the daily life of the people living with dementia and embedding it in the culture of the nursing home. Incorporating daily garden use does not necessarily mean an additional task, but rather rearranging priorities and moving the usual activities outside part of the time.[12]

CONCLUSIONS AND IMPLICATIONS

Garden use seems to have a positive effect on QoL and BPSD in people living with dementia in nursing homes. However, consensus regarding measurements and key outcomes, taking into account the physical, social, and organizational aspects when designing the garden use intervention, is necessary for the reliable evaluation of these interventions.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

MV-v, HV, WA, and MC: study design, writing the study protocol, and writing of the manuscript. MV-v: database search. MV-v, RH-v, HV, WA, and MC: data analysis and interpretation. All authors read and approved the final version of the manuscript.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

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REFERENCES

1. Sachdev PS, Blacker D, Blazer DG, Ganguli M, Jeste DV, Paulsen JS, et al. Classifying neurocognitive disorders: The DSM-5 approach. Nat Rev Neurol. (2014) 10:634–42. doi:10.1038/nrneurol.2014.181
2. Banerjee S, Samsi K, Petrie CD, Alvir J, Treglia M, Schwam EM, et al. What do we know about quality of life in dementia? A review of the emerging evidence on the predictive and explanatory value of disease specific measures of health related quality of life in people with dementia. Int J Geriatr Psychiatry. (2009) 24:15–24. doi: 10.1002/gps.2090
3. den Ouden M, Bleijlevens MHC, Meijers JMM, Zwakhalen SMG, Braun SM, Tan FES, et al. Daily (In) Activities of nursing home residents in their wards: An observation study. J Am Med Dir Assoc. (2015) 16:963–8. doi: 10.1016/j.jamda.2015.05.016
4. Alzheimer Nederland, Vilans. Zorgstandaard Dementie. (2013). Available online at: https://www.zorgvoorbeter.nl/docs/beteroud/ngn/zorgstandaard-dementie-2013.pdf
5. Ettema TP, Dröes R-M, de Lange J, Ooms ME, Mellenbergh GJ, Ribbe MW. The concept of quality of life in dementia in the different stages of the disease. Int Psychogeriatr. (2005) 17:353–70. doi: 10.1017/S1041610205002073
6. Finkel SI, Silva JC, Cohen G, Miller S, Sartorius N. Behavioral and psychological signs and symptoms of dementia: A consensus statement on current knowledge and implications for research and treatment. Int Psychogeriatr. (1996) 8:497–500. doi:10.1017/S1041610297003943
7. Kales HC, Gitlin LN, Lyketsos CG. Assessment and management of behavioral and psychological symptoms of dementia. Br Med J. (2015) 350:bmj.h369. doi:10.1136/bmj.h369
8. Abraha I, Rimland JM, Trotta FM, Dell'Aquila G, Cruz-Jentoft A, Petrovic M, et al. Systematic review of systematic reviews of non-pharmacological interventions to treat behavioural disturbances in older patients with dementia. The SENATOR-OnTop series. Br Med J Open. (2017) 7:e012759. doi: 10.1136/bmjopen-2016-012759
9. Buck D. Gardens and Health: Implications for Policy and Practice. The King's Fund (2016). Available online at: https://www.kingsfund.org.uk/sites/default/files/field/field_publication_file/Gardens_and_health.pdf
10. Nicholas SO, Giang AT, Yap PLK. The effectiveness of horticultural therapy on older adults: A systematic review. J Am Med Direct Assoc. (2019) 20:1351.e1. doi:10.1016/j.jamda.2019.06.021
11. de Boer B, Hamers JPH, Zwakhalen SMG, Tan FES, Beerens HC, Verbeek H. Green care farms as innovative nursing homes, promoting activities and social interaction for people with dementia. J Am Med Dir Assoc. (2017) 18:40–6. doi: 10.1016/j.jamda.2016.10.013
12. van der Velde-van Buuringen M, Achterberg WP, Caljouw MAA. Daily garden use and quality of life in persons with advanced dementia living in a nursing home: A feasibility study. Nurs Open. (2020) 2020:740. doi: 10.1002/nop2.740
13. Kitwood TM, Kitwood T. Dementia Reconsidered: The Person Comes First. Vol. 20. Buckingham: Open University Press (1997).
14. Mitchell G, Agnelli J. Person-centred care for people with dementia: Kitwood reconsidered. Nurs Stand. (2015) 30:46–50. doi: 10.7748/ns.30.7.46.s47
15. Hartig T, Mitchell R, de Vries S, Frumkin H. Nature and health. Ann Rev Publ Health. (2014) 35:207–28. doi: 10.1146/annurev-publhealth-032013-182443
16. Ulrich RS. Aesthetic and affective response to natural environment. In: I Altman, JF Wohlwill, editors, Behavior and the Natural Environment. Springer US: Boston,MA. (1983). p. 85–125. doi:10.1007/97814613-3539-9_4
17. Ulrich RS, Simons RF, Losito BD, Fiorito E, Miles MA, Zelson M. Stress recovery during exposure to natural and urban environments. J Environ Psychol. (1991) 11:201–30. doi:10.1016/S02724944(05)80184-7

18. Kaplan S. The restorative benefits of nature: Toward an integrative framework. J Environ Psychol. (1995) 15:169–82. doi: 10.1016/0272-4944(95)90001-2

19. Motealleh P, Moyle W, Jones C, Dupre K. Creating a dementiafriendly environment through the use of outdoor natural landscape design intervention in long-term care facilities: A narrative review. Health Place. (2019) 58:102148. doi: 10.1016/j.healthplace.2019.102148

20. van den Berg MEL, Winsall M, Dyer SM, Breen F, Gresham M, Crotty M. Understanding the barriers and enablers to using outdoor spaces in nursing homes: A systematic review. Gerontologist. (2020) 60:E254–69. doi: 10.1093/geront/gnz055

21. Whear R, Coon JT, Bethel A, Abbott R, Stein K, Garside R.What is the impact of using outdoor spaces such as gardens on the physical and mental well-being of those with dementia? A systematic review of quantitative and qualitative evidence. J AmMed Dir Assoc. (2014) 15:697–705. doi:10.1016/j.jamda.2014.05.013

22. Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. Br Med J. (2009) 339:b2535. doi: 10.1136/bmj.b2535

23. Sanford AM, Orrell M, Tolson D, Abbatecola AM, Arai H, Bauer JM, et al. An international definition for "nursing home". J Am Med Direct Assoc. (2015) 16:181–4. doi: 10.1016/j.jamda.2014.12.013

24. El-Awaisi A, Joseph S, Hajj MSE, Diack L. The Mixed Methods Appraisal Tool (MMAT) version 2018 for information professionals and researchers. Educ Inform. (2018) 34:1–7. doi: 10.3233/EFI-180221

25. Detweiler MB, Murphy PF, Kim KY, Myers LC, Ashai A. Scheduled medications and falls in dementia patients utilizing a wander garden. Am J Alzheimers Dis Other Demen. (2009) 24:322–32. doi:10.1177/1533317509334036

26. Detweiler MB, Murphy PF, Myers LC, Kim KY. Does a wander garden influence inappropriate behaviors in dementia residents? Am J Alzheimers Dis Other Demen. (2008) 23:31–45. doi:10.1177/1533317507309799

27. Murphy PF, Miyazaki Y, Detweiler MB, Kim KY. Longitudinal analysis of differential effects on agitation of a therapeutic wander garden for dementia patients based on ambulation ability. Dementia. (2010) 9:355–73. doi: 10.1177/1471301210375336

28. Bourdon E, Belmin J. Enriched gardens improve cognition and independence of nursing home residents with dementia: A pilot controlled trial. Alzheimers Res Ther. (2021) 13:116. doi:10.1186/s13195-021-00849-w

29. Calkins M, Szmerekovsky JG, Biddle S. Effect of increased time spent outdoors on individuals with dementia residing in nursing homes. J Hous Elderly. (2007) 21:211–28. doi: 10.1300/J081v21n03_11

30. Cohen-Mansfield J. Outdoor wandering parks for persons with dementia. J Hous Elderly. (2007) 21:35–53. doi: 10.1300/J081v21n01_03

31. Connell BR, Sanford JA, Lewis D. Therapeutic effects of an outdoor activity program on nursing home residents with dementia. J Hous Elderly. (2007) 21:195–209. doi: 10.1300/J081v21n03_10

32. Cox H, Burns I, Savage S. Multisensory environments for leisure: Promoting well-being in nursing home residents with dementia. J Gerontol Nurs. (2004) 30:37–45. doi: 10.3928/0098-9134-20040201-08

33. Dyer SM, Liu E, Gnanamanickam E, Harrison SL, Milte R, Crotty M. Associations between quality of life and outdoor access in nursing homes: A cross-sectional study. Ann Longterm Care. (2021) e1–7. doi:10.25270/altc.2021.02.00001

34. Edwards CA, McDonnell C, Merl H. An evaluation of a therapeutic garden's influence on the quality of life of aged care residents with dementia. Dementia. (2013) 12:494–510. doi:10.1177/1471301211435188

35. Evans SC, Barrett J, Mapes N, Hennell J, Atkinson T, Bray J, et al. Connections with nature for people living with dementia. Work Older People. (2019) 23:142–51. doi: 10.1108/WWOP-01-2019-0003

36. Goto S, Shen X, Sun M, Hamano Y, Herrup K. The positive effects of viewing gardens for persons with dementia. J Alzheimers Dis. (2018) 66:1705–20. doi: 10.3233/JAD-170510

37. Hendriks IH, van Vliet D, Gerritsen DL, Dröes R-M. Nature and dementia: Development of a person-centered approach. Int Psychogeriatr. (2016) 28:1455–70. doi: 10.1017/S1041610216000612

38. Dröes R-M, Knoop ECCB-VD, Bos J, Meihuizen L, Ettema TP, Gerritsen DL, et al. (2006).Quality of life in dementia in perspective: an explorative study of variations in opinions among people with dementia and their professional caregivers, and in literature. Dementia Int J. 5:533–58. doi:10.1177/1471301206069929

39. Hernandez RO. Effects of therapeutic gardens in special care units for people with dementia: Two case studies. J Hous Elderly. (2007) 21:117–52. doi: 10.1300/J081v21n01_07

40. Liao M-L, Ou S-J, Hsieh CH, Li Z, Ko C-C. Effects of garden visits on people with dementia: A pilot study. Dementia Int J Soc Res Practice. (2020) 19:1009–28. doi: 10.1177/1471301218793319

41. Mather JA, Nemecek D, Oliver K. The effect of a walled garden on behavior of individuals with Alzheimer's. Am J Alzheimer's Dis. (1997) 12:252–7. doi: 10.1177/153331759701200603

42. Motealleh P, Moyle W, Jones C, Dupre K. The impact of a dementia-friendly garden design on people with dementia in a residential aged care facility: A case study. HERD. (2022) 15:196–218. doi:10.1177/19375867211063489

43. White PC, Wyatt J, Chalfont G, Bland JM, Neale C, Trepel D, et al. Exposure to nature gardens has time-dependent associations with mood improvements for people with mid- and late-stage dementia: Innovative practice. Dementia. (2018) 17:627–34. doi: 10.1177/1471301217723772

44. Grol R, Wensing M. What drives change? Barriers to and incentives for achieving evidence-based practice. Med J Austr. (2004) 180:S57–60. doi: 10.5694/j.1326-5377.2004.tb05948.x

45. de Boer B, Bozdemir B, Jansen J, Hermans M, Hamers JPH, Verbeek H. The homestead: Developing a conceptual framework through co-creation for innovating long-term dementia care environments. Int J Environ Res Public Health. (2021) 18. doi: 10.3390/ijerph18010057

46. Buist Y, Verbeek H, de Boer B, de Bruin SR. Innovating dementia care; implementing characteristics of green care farms in other long-term care settings. Int Psychogeriatr. (2018) 30:1057–68. doi: 10.1017/S1041610217002848

47. de Boer B, Beerens HC, Zwakhalen SMG, Tan FES, Hamers JPH, Verbeek H. Daily lives of residents with dementia in nursing homes: Development of the Maastricht electronic daily life observation tool. Int Psychogeriatr. (2016) 28:1333–43. doi: 10.1017/S1041610216000478

3

Which characteristics are associated with going outside for people living with dementia in nursing homes? A cross-sectional study

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ABSTRACT

This cross-sectional study explores the frequency of going outside and characteristics that are associated with going outside for people living with dementia in nursing homes in the Netherlands. A subsample of a national survey in 353 nursing homes was used (N = 693). Two-thirds (66.5%) go outside often. Compared to those who rarely or never go outside, participants who go outside often receive visits more often (odds ratio (OR) 1.68, 95% confidence interval (CI) 1.02–2.75), have less severe physical impairments (severe vs. mild: OR 0.17, 95% CI 0.04–0.73; very severe vs. mild: OR 0.11, 95% CI 0.03–0.49), use less pain medication (OR 0.61, 95% CI 0.38–0.98), experience higher positive affect (OR 1.10, 95% CI 1.03–1.17), and feel less at home (OR 0.86, 95% CI 0.76–0.97). These findings are the first step in developing effective interventions that will contribute to people living with dementia going outside more often.

WHAT THIS PAPER ADDS

- Two in three people living with dementia in nursing homes go outside often.
- Receiving visits, pain medication, the level of physical impairments, positive affect, and feeling at home were independently associated with the frequency of going outside.
- The level of physical impairments explained the largest proportion of variability in the frequency of going outside.

APPLICATIONS OF STUDY FINDINGS

- Identifying characteristics that act as barriers or enablers to go outside is crucial for developing effective interventions to make going outside a normal part of daily nursing home practice for people living with dementia.
- Given that the level of physical impairments explained the largest proportion of the variability in the frequency of going outside, interventions should start with focusing on addressing this important factor.

INTRODUCTION

There are 300,000 people living with dementia in the Netherlands, of whom 80,000 live in nursing homes.[1] These nursing homes are often mixed, housing somatic and psychogeriatric residents, and often have specialized wards for people living with dementia. Dementia is a major neurocognitive disorder, with a progressive decline in various cognitive functions influencing intellectual, social, and physical functioning.[2, 3] Due to this decline, performing normal daily activities, such as going outside independently, becomes increasingly challenging.

In recent years, an increasing number of studies focus on the effects of going outside on people living with dementia in nursing homes. The term "outside" can refer to various settings such as a garden, balcony, or short walks outside the grounds of the nursing home. Overall, first results appear to suggest positive effects of garden use on quality of life (QoL), behavioral and psychological symptoms of dementia (BPSD), other outcomes (stress, sleep, and mood), and physical and cognitive abilities.[4, 5] For example, in one pilot study evaluating the effects of garden visits, staff reported that garden visits reduced residents' depression, anxiety/agitation, and aggression/anger significantly more than other behavioral problems.[6] Another study investigated the effects of viewing a garden on physiological stress.[7] People living with dementia viewed the specially constructed garden two times a week for 15 minutes together with a caregiver and researcher.[7] Garden observation with the door open relieved physiological stress, as reflected in a sustained drop in the pulse rate.[7]

Several qualitative studies exploring benefits, personalization, and the effect of garden use on QoL revealed themes around experiences and possible mechanisms of the positive effects of going outside from the perspectives of people living with dementia, staff members, and relatives.[8-10] Garden use seems to have a positive effect on QoL by facilitating a sense of freedom, social interaction, a calming effect, reminiscence, and pleasure.[5, 8-10]

Despite these benefits, it seems that going outside is still not a normal part of daily nursing home practice. Furthermore, there is a paucity of data on the access to, and use of the outside area.[11] Sixty percent of all residents living in a nursing home experience health-related barriers to going outside, while 34% experience barriers related to a lack of company.[12] Also, environmental factors seem to play a role as a barrier or enabler to using the outdoor area, such as design of the outdoor area, staffing and resident safety, weather and seasons, design of the main building, and social activities.[11, 13]

Identifying characteristics that act as barriers or enablers to use the outdoor area is crucial to adequately reduce barriers and develop interventions to make going outside a normal part of daily nursing home practice for people living with dementia. To the authors' knowledge, there is no data specifically for the population of people living with dementia regarding the frequency of going outside and which resident characteristics are independently associated with it. Therefore, the present study aims to explore the frequency of going outside and the characteristics that are associated with going outside for people living with dementia in nursing homes in the Netherlands and addressed the following research question: "How often do people living with dementia in nursing homes go outside and which resident characteristics are associated with the frequency of going outside?"

METHODS

Data Source, Setting, and Participants

The present study was part of a survey that aimed to provide a national overview of the life situation, perceived quality of life and care for older nursing home residents in the Netherlands, carried out by Statistics Netherlands (CBS) in collaboration with The Netherlands Institute for Social Research (SCP).[12, 13] The methods are fully described in the study protocol of the survey in DANS.[13] In summary, to ensure a representative sample of residents living in nursing homes in the Netherlands, this survey used a two-phase stratified sampling method. Between January 2nd and December 31st 2019, data was collected on a population of 1837 residents of 55 years or older in 353 nursing homes.[13] In the first phase, institutions were selected based on their size, with probabilities proportional to size. The selection was stratified by province to ensure representation from across the country. The selected institutions were then contacted by telephone for participation. Once an institution agreed to participate, a second-phase sample was drawn within that institution. A simple random sample of 12 residents was selected. The first 8 residents were included in the study sample and the remaining 4 residents served as reserves in case of eligibility issues. This design ensured that all residents in the target population had an equal chance of being included in the sample.

Participants were interviewed verbally, and if they were not capable of answering the questions themselves, (part of) the questions were submitted in writing to the care provider with primary responsibility for the participant, and the other part to a family member.[13] Written informed consent was obtained from the participants or family members and caregivers who acted as a proxy for participants living with dementia.

The present study used a subsample of the original study. Only participants living with dementia for whom the question about frequency of going outside was answered were included (N = 693). In this subsample, all questions were answered by proxies (family members and caregivers).

Outcome Measures

Frequency of Going Outside
The primary outcome measure was frequency of going outside and was operationalized in the question: "How often does the resident normally go outside, if the weather permits?" This question could be answered with "daily, weekly, monthly, or rarely or never." The purpose of going outside did not matter, as long as the resident is going outside the nursing home building. They could, for example, take a walk around the building or just sit and take a nap in the nursing home garden. The participants could go outside alone, accompanied, or both.

Selection of Characteristics Associated with Frequency of Going Outside
Based on literature [4, 5, 8-11, 14, 15] and clinical experience of the authors, potential correlates for the frequency of going outside were selected and categorized in sociodemographic characteristics, health and function-related characteristics, external factors, wishes and satisfaction, and quality of life.

Sociodemographic Characteristics
For this study, data were collected on age, gender, having a partner, level of urbanization, receiving visits, and receiving informal care.

Health and Function-Related Characteristics
Information on severity of physical impairment, need of walking aid, number of chronic diseases, pain medication, medication for psychological problems, pain, and sleeping problems was gathered. Also collected was information about how health in general hindered the frequency of going outside.

External Factors, Wishes, and Satisfaction
Data were collected on external factors such as a lack of company or transport, bad weather, or no available staff to assist the participant with going outside. Information on wanting to go outside more often as well as satisfaction with the outside area was also collected.

Quality of Life
Quality of life (QoL) was assessed with the QUALIDEM, which includes 40 items that apply to people living with mild to severe dementia in nine QoL domains (care relationships, positive affect, negative affect, restless tense behavior, positive self-

image, social relations, social isolation, feeling at home, and having something to do).[16] Two caregivers scored the items after an observation period of one week. The QUALIDEM has satisfactory reliability (rho ranging from .60 to .90) and validity (Cronbach's alpha ranging from .59 to .89).[16, 17]

Statistical Analysis

Participants were stratified into an "often" and a "rarely or never" go outside group based on whether the participants go outside daily/weekly (often) or monthly/rarely or never (rarely or never). The Kruskal–Wallis test and the Pearson's chi-square test were used to assess differences between resident characteristics. A p-value of ≤.05 was considered statistically significant.

All categorical factors were dichotomized by merging categories. In four categories (severity physical impairment, number of chronic diseases, pain, and sleeping problems), dummy variables were created.

For each characteristic, we performed a univariate logistic regression analysis with the frequency of going outside as the dependent variable. Subsequently, a stepwise backward procedure was used for the multivariate regression model, including variables with a p-value of ≤.30. This threshold was chosen to ensure that potential correlates for the frequency of going outside were not excluded prematurely. While a p-value of ≤.30 may include variables with weaker predictive value, it is allowed for a more comprehensive exploration of the data. This approach ensures that variables which might become significant in the presence of others are considered, particularly in analyses where the relationships between predictors may not be straightforward.[18]

In the final multivariate regression model, only variables with a p-value of ≤.05, without multicollinearity, were accepted.

All analyses were performed with SPSS PASW Statistics, version 18.0.0, 2015 (SPSS Inc, IBM, Chicago, IL).

RESULTS

Study Population

Table 1 presents the characteristics of the participants who go outside often versus rarely or never go outside. Most participants were female (75.2%), without a partner (76.6%) and had a median age of 86.0 years (IQR 81.0–91.0). Approximately two-thirds (66.5%) of the participants go outside often.

Table 1. *Characteristics of the study population (n=693)*

		Frequency of going outside		
Characteristics	**Total Group**	**Often**	**Rarely or never**	***p*-value[‡]**
Sociodemographic variables				
Frequency, *n (%)*	693 (100)	461 (66.5)	232 (33.5)	-
Age in years, median (*IQR*)	86.0 (81.0-91.0)	86.0 (80.0-90.8)	87.0 (82.0-91.0)	.012[†] [§]
Female, *n (%)*	521 (75.2)	346 (75.1)	175 (75.4)	.914[‖]
Partner, *n (%)*	162 (23.4)	106 (23.0)	56 (24.1)	.737 [‖]
Urbanized, *n (%)*	364 (52.5)	228 (49.5)	136 (58.6)	.023[†] [‖]
Receiving minimum of Daily/weekly visits[#], *n (%)*	492 (71.8)	340 (74.6)	152 (66.4)	.025[†] [‖]
Receiving informal care[#], *n (%)*	609 (88.3)	419 (91.3)	190 (82.3)	.001* [‖]
Health and function-related characteristics				
Severity physical impairment[#], *n (%)*				<.001* [‖]
None/Light/Moderate	75 (10.9)	70 (15.3)	5 (2.2)	
Severe	299 (43.4)	210 (45.9)	89 (38.5)	
Very severe	315 (45.7)	178 (38.9)	137 (59.3)	
Need of walking aid[#], *n (%)*	420 (61.9)	277 (60.7)	143 (64.1)	.394 [‖]
Number of chronic diseases, *n (%)*				.173 [‖]
1	49 (7.1)	37 (8.0)	12 (5.2)	
2-4	402 (58.0)	272 (59.0)	130 (56.0)	
≥5	242 (34.9)	152 (33.0)	90 (38.8)	
Medication[##], *n (%)*				
Pain	315 (50.6)	188 (46.0)	127 (59.6)	.005* [‖]

Table 1. *Continued*

Characteristics	Total Group	Frequency of going outside		
		Often	Rarely or never	*p*-value[‡]
Psychological problems	218 (35.0)	140 (34.2)	78 (36.6)	.554[‖]
Pain[#], *n (%)*				.018[*‖]
Rarely or never	281 (41.5)	204 (45.2)	77 (34.1)	
Sometimes	220 (32.5)	140 (31.0)	80 (35.4)	
Often	176 (26.0)	107 (23.7)	69 (30.5)	
Sleeping problems[###], *n (%)*				.125[‖]
Rarely or never	290 (51.4)	200 (52.5)	90 (49.2)	
Sometimes	157 (27.8)	111 (29.1)	46 (25.1)	
Often	117 (20.7%)	70 (18.4)	47 (25.7)	
Frequency of going outside hindered by[#####], *n (%)*				
Health	193 (60.9)	121 (57.9)	72 (66.7)	.129[‖]
External factors, wishes and satisfaction				
Frequency of going outside hindered by[#####], *n (%)*				
Lack of transportation	76 (24.0)	49 (23.4)	27 (25.0)	.759[‖]
Lack of company	82 (25.9)	62 (29.7)	20 (18.5)	.032[*‖]
Other	66 (20.8)	38 (18.2)	28 (25.9)	.108[‖]
Want to go outside more often[###], *n (%)*	279 (54.9)	200 (57.0)	79 (50.3)	.163[‖]
Satisfied with outside area[#], *n (%)*	566 (82.9)	390 (85.3)	176 (77.9)	.015[*‖]

Table 1. *Continued*

Characteristics	Total Group	Frequency of going outside		
		Often	Rarely or never	*p*-value[†]
Quality of life				
Quality of life[###], QUALIDEM median (*IQR*)				
Care relationship	17 (13-20)	17 (14-20)	16 (13-20)	.182[§]
Positive affect	15 (12-18)	16 (13-18)	14 (11-18)	.001*[§]
Negative affect	6 (5-6)	6 (5-6)	6 (5-6)	.303[§]
Restless tense behavior	6 (3-8)	6 (3-8)	6 (4-8)	.539[§]
Positive self-image	8 (6-9)	8 (6-9)	8 (6-9)	.361[§]
Social relations	12 (9-15)	12 (9-15)	11 (8-13.25)	<.001*[§]
Social isolation	7 (6-9)	8 (5-9)	7 (6-9)	.402[§]
Feeling at home	11 (9-12)	11 (9-12)	11 (10-12)	.055[§]
Having something to do	2 (0-3)	2.5 (1-4)	2 (0-3)	<.001*[§]

*$p \leq .01$, †$p \leq .05$
† p-value between residents who go outside often vs rarely or never; § Kruskal-Wallis test; ‖ Pearson's Chi-square test.
IQR: Interquartile range.
= Missing (n) 3-20.
= Missing (n) 20-100.
= Missing (n) 100-210.
= Missing (n) 210-300.
= Missing (n) 300-376.

Univariate Analyses

Participants who go outside often were slightly younger (86.0 years of age, IQR 80.0–90.8; vs. 87.0 years of age, IQR 82.0–91.0), lived in an urbanized environment less often (49.5%; vs. 58.6%), received informal care more often (91.3%; vs. 82.3%), and received a minimum of daily or weekly visits more often (74.6%; vs. 66.4%) than participants who rarely or never go outside (see **Table 2**). Also, they used pain medication less often (46.0%; vs. 59.6%), were prevented from going outside more frequently due to a lack of company more often (29.7%; vs. 18.5%), and were satisfied with the outside environment more often (85.3%; vs. 77.9%), compared to participants who rarely or never go outside. They had higher scores on the QUALIDEM domains of positive affect (16, IQR 13–18; vs. 14, IQR 11–18), social relations (12, IQR 9–15; vs. 11, IQR 8–13.25), and having something to do (2.5, IQR 1–4; vs. 2, IQR 0–3). No significant differences were found for the other outcomes.

Table 2. *Univariate logistic regression for each potentially correlated characteristic to the frequency of going outside*

	OR	95% CI	p-value**
Sociodemographic variables			
Age (continuous)	0.97	0.95- 0.99	0.010*
Gender (female vs male)	0.98	0.68-1.41	0.914
Partner (yes vs no)	0.94	0.65-1.36	0.737
Urbanized (somewhat to not urbanized vs urbanized)	1.45	1.05-1.99	0.023†
Receiving visits (daily/weekly vs less than daily/weekly)	1.49	1.05-2.10	0.025†
Receiving informal care (yes vs no)	2.26	1.42-3.61	0.001*
Health and function-related characteristics			
Severity physical impairment			
(severe vs none/light/moderate)	0.17	0.07-0.43	<.001*
(very severe vs none/light/moderate)	0.09	0.04-0.24	<.001*
Need of walking aid (yes vs no)	0.87	0.62-1.12	0.395
Number of chronic diseases			
(2-4 vs 1)	0.68	0.34-1.35	0.266‖
(≥5 vs 1)	0.55	0.27-1.11	0.093‡
Medication for pain (yes vs no)	0.56	0.39-0.80	0.001*
Medication for psychological problems (yes vs no)	0.87	0.61-1.24	0.432
Pain			
(sometimes vs rarely or never)	0.66	0.45-0.97	0.032†
(often vs rarely or never)	0.59	0.39-0.87	0.009*

Table 2. *Continued*

	OR	95% CI	p-value**
Sleeping problems			
(sometimes vs rarely or never)	1.09	0.71-1.66	0.704
(often vs rarely or never)	0.67	0.43-1.05	0.078‡
Frequency of going outside hindered by health (yes vs no)	0.69	0.42-1.12	0.130§
External factors, wishes and satisfaction			
Frequency of going outside hindered by lack of transportation (yes vs no)	0.92	0.54-1.58	0.759
Frequency of going outside hindered by lack of company (yes vs no)	1.86	1.05-3.28	0.033†
Frequency of going outside hindered by other reason (yes vs no)	0.64	0.36-1.11	0.109§
Want to go outside more often (yes vs no)	1.31	0.90-1.91	0.164§
Satisfied with outside area (yes vs no)	1.65	1.10-2.49	0.015†
Quality of life (QUALIDEM)			
Care relationship (continuous)	1.03	0.99-1.08	0.160§
Positive affect (continuous)	1.10	1.05-1.16	<.001*
Negative affect (continuous)	1.08	0.93-1.27	0.316
Restless tense behavior (continuous)	0.98	0.92-1.04	0.535
Positive self-image (continuous)	1.05	0.96-1.15	0.308
Social relations (continuous)	1.10	1.05-1.15	<.001*
Social isolation (continuous)	1.03	0.96-1.12	0.399
Feeling at home (continuous)	0.90	0.83-0.98	0.016†
Having something to do (continuous)	1.25	1.12-1.39	<.001*

*$p \leq .01$, †$p \leq .05$, ‡$p \leq .10$, §$p \leq .20$, ‖$p \leq .30$
** p-value between residents who go outside often vs rarely or never.
OR: Odds ratio; CI: Confidence interval.

Multivariate Analyses

In the final multivariate model, five variables remained that are independently associated with the frequency of going outside (see **Table 3**; n = 388). Participants who receive visits daily or weekly were 1.68 times more likely to go outside often as compared to those receiving visits less frequently (odds ratio (OR) 1.68; 95% confidence interval (CI) 1.02–2.75). Participants with severe physical impairment were 0.17 times less likely (OR 0.17; 95% CI 0.04–0.73), and participants with very severe physical impairment were 0.11 times less likely (OR 0.11; 95% CI 0.03–0.49), to go outside often than those with no, mild, or moderate physical impairment. Participants taking medication for pain were 0.61 times less likely (OR 0.61, 95% CI 0.38–0.98) to go outside often compared to those not taking medication. Positive affect was positively associated with going outside often (OR 1.10; 95% CI 1.03–1.17), suggesting that when the score of positive affect increases by

one point, participants were 1.10 times more likely to go outside often. Feeling at home was negatively associated with going outside often (OR 0.86; 95% CI 0.76–0.97), suggesting that when the score of feeling at home increases by one point, participants were 0.86 times less likely to go outside often.

The Nagelkerke R square was 0.172, that is, the model explains 17.2% of the variability in the frequency of going outside. Further analyses showed that the variable severity of physical impairment explained the largest portion of the variability in the frequency of going outside.

Table 3. *Final multivariate model for the frequency of going outside (n=388)*

Variable	B	OR	95% CI	p-value*
Receiving visits (daily/weekly vs less than daily/weekly)	0.52	1.68	1.02-2.75	0.040
Severity physical impairment				0.007
(severe vs none/light/moderate)	-1.80	0.17	0.04-0.73	0.017
(very severe vs none/light/moderate)	-2.21	0.11	0.03-0.49	0.004
Medication for pain (yes vs no)	-0.50	0.61	0.38-0.98	0.039
QoL Positive affect (continuous)	0.09	1.10	1.03-1.17	0.005
QoL Feeling at home (continuous)	-0.15	0.86	0.76-0.97	0.011

*p-value between residents who go outside often vs rarely or never.
OR: Odds ratio; CI: Confidence interval.

DISCUSSION

The present study aimed to explore the frequency of going outside and the characteristics that are associated with going outside for people living with dementia in nursing homes. The results show that approximately two-thirds of the participants go outside often, and one-third go outside rarely or never. Five factors were independently associated with the frequency of going outside. The findings revealed that participants who go outside often receive daily or weekly visits, have a higher positive affect, have less severe physical impairment, do not take medication for pain, and feel less at home.

This is one of the first studies to examine possible characteristics of people living with dementia in nursing homes that are associated with the frequency of going outside. Many previous studies focused on the effects of going outside, not on characteristics. Despite this difference, the findings of our study appear to be in line with the key themes of the results of these previous studies.[8-10] For example, one study showed that people living with dementia in nursing homes experience pleasure, relaxation, feeling fit, enjoying the beauty of nature, feeling free, the

social aspect of nature, feeling useful, and memories, as being important for their QoL when outside.[9] In another study, staff members highlighted numerous ways in which nature-based activities positively impacted the QoL of people living with dementia in nursing homes. These included high levels of engagement, a sense of freedom, creativity, increased social interaction, inter-generational contact with families, and the calming effect of contact with animals.[8] In addition, a feasibility study found that people living with dementia showed increased positive affect and decreased social isolation on the QUALIDEM during an intervention period of going outside.[10]

Given that severity of physical impairment explained the largest proportion of the variability in the frequency of going outside, interventions should start with focusing on addressing this important factor. The systematic review of van den Berg et al. (2020) revealed the importance of a well-designed physical environment to enable and support garden use by residents with physical impairments. Their results showed that the design of the outside area was the most frequently mentioned main barrier or enabler across all included studies. Multiple, easy-to use-access points, safety elements such as glare-free and slip-resistant pathways with handrails, and appropriate lighting are necessary to help residents with physical impairments overcome mobility problems and gain access to the outside area.[11, 19, 20] Including elements that contribute to a sense of familiarity could also help the outside area contribute to a sense of home.[11, 21] In addition, interventions that focus on stimulating and facilitating residents to engage in more social activities could improve the social system around the resident and positively influence the frequency of visits from family and friends. A well-designed outside area with organized programmed activities can facilitate this.[11, 22] Combining these elements by creating an easy-to-access, safe, familiar, green, and natural outside area, with organized programmed activities, may generate a feeling of satisfaction with the outside area.

This study has some considerable strengths, and one being that it used a subsample of a national survey. The two-phase stratified sampling method to collect this survey data minimizes biases and ensures high quality of the collected information. Also, the large sample, with a population of 1837 residents in 353 nursing homes, is a strength. Therefore, findings of this study may be generalizable to other nursing homes in the Netherlands that were not included in this sample. However, variations in operational standards, cultural contexts, and climate may influence the applicability of these findings across different settings. To date, limited research has addressed generalizability in this field. Goto et al. (2018) examined the effects of exposure to a Japanese garden across different locations, countries, cultures, and ethnic groups, demonstrating that the positive effects of garden observation were consistent across these varying environments. While

these findings are encouraging, more research is necessary to fully understand the applicability of the results from the current study in other settings.

There are also some limitations. The study used a cross-sectional design, which limits the possibility to establish causal relationships between the identified characteristics and the frequency of going outside. It is therefore impossible to say whether the significant characteristics found are traits of the people living with dementia in nursing homes themselves that cause them to go outside more often, or that these factors are a result of going outside more often, or that an unknown factor influences both. Future longitudinal studies should provide a better understanding of these temporal associations between these characteristics. In addition, a Nagelkerke R square of 0.172 that explains 17.2% of the variability in the frequency of going outside still leaves 82.8% of the variability unexplained. Also, the study relied solely on proxy responses from family members and caregivers, which may introduce response biases.[23, 24] These biases can influence the results and affect the validity of the findings, as proxies may have different perceptions or levels of awareness regarding the residents' true preferences and experiences.[25, 26] Future research could focus on mitigation strategies, such as using observational methods, to provide more accurate information. Furthermore, "going outside" was not explicitly defined in the questionnaire. The question asked proxies to indicate how often the resident typically goes outside when the weather permits. The lack of a precise definition may introduce some ambiguity into the interpretation of responses. Future studies could consider providing clearer definitions to gain a more accurate understanding of residents' outdoor activities. Last, by stratifying the participants into an "often" go outside and a "rarely or never" go outside group, the authors chose to qualify going outside weekly as "often." This stratification may have influenced the results.

CONCLUSIONS AND IMPLICATIONS

This study indicates that two in three people living with dementia in nursing homes go outside often. Receiving visits, pain medication, and the level of physical impairments, positive affect, and feeling at home were independently associated with the frequency of going outside. These findings are the first step in developing effective interventions that will contribute to people living with dementia going outside more often.

Declaration of Conflicting Interests

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Ethical Statement

Ethical Approval
Please add the full name of the Ethical Board or Committee that approved your study and the ethics approval reference/number to your title page: N/A.

Informed Consent
Written informed consent was obtained from client- or family counsels of participating nursing homes. Written informed consent was also obtained from family members and caregivers who acted as a proxy for residents with dementia.

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REFERENCES

1. Alzheimer Nederland. (2021). Factsheet cijfers en feiten over dementie. Retrieved 2024, from. https://www.alzheimernederland.nl/factsheet-cijfers-en-feiten-over-dementie
2. Banerjee, S., Samsi, K., Petrie, C. D., Alvir, J., Treglia, M., Schwam, E. M., & del Valle, M. (2009). What do we know about quality of life in dementia? A review of the emerging evidence on the predictive and explanatory value of disease specific measures of health related quality of life in people with dementia. International Journal of Geriatric Psychiatry, 24(1), 15–24. https://doi.org/10.1002/gps.2090
3. Sachdev, P. S., Blacker, D., Blazer, D. G., Ganguli, M., Jeste, D. V., Paulsen, J. S.,&Petersen, R. C. (2014). Classifying neurocognitive disorders: The DSM-5 approach. Nature Reviews Neurology, 10(11), 634–642. https://doi.org/10.1038/nrneurol.2014.181
4. Nicholas, S. O., Giang, A. T., & Yap, P. L. K. (2019). The effectiveness of horticultural therapy on older adults: A systematic review. Journal of the American Medical Directors Association, 20(10), 1351.e1–1351.e11. https://doi.org/10.1016/j.jamda.2019.06.021
5. Velde-van Buuringen, M. v. d., Hendriks-van der Sar, R., Verbeek, H., Achterberg, W. P., & Caljouw, M. A. A. (2023). The effect of garden use on quality of life and behavioral and psychological symptoms of dementia in people living with dementia in nursing homes: A systematic review. Frontiers in Psychiatry, 14, 1044271. https://doi.org/10.3389/fpsyt.2023.1044271
6. Liao, M. L., Ou, S. J., Hsieh, C. H., Li, Z. L., & Ko, C. C. (2020). Effects of garden visits on people with dementia: A pilot study. Dementia-International Journal of Social Research and Practice, 19(4), 1009–1028. https://doi.org/10.1177/1471301218793319
7. Goto, S., Shen, X., Sun, M., Hamano, Y., & Herrup, K. (2018). The positive effects of viewing gardens for persons with dementia. Journal of Alzheimer's Disease, 66(4), 1705–1720. https://doi.org/10.3233/jad-170510
8. Evans, S. C., Barrett, J.,Mapes, N., Hennell, J., Atkinson, T., Bray, J., Garabedian, C., & Russell, C. (2019). Connections with nature for people living with dementia. Working with Older People, 23(3), 142–151. https://doi.org/10.1108/wwop-01-2019-0003
9. Hendriks, I. H., van Vliet, D., Gerritsen, D. L., & Droes, R. M. (2016). Nature and dementia: Development of a personcentered approach. International Psychogeriatrics, 28(9), 1455–1470. https://doi.org/10.1017/s1041610216000612
10. van der Velde-van Buuringen, M., Achterberg, W. P., & Caljouw, M. A. A. (2020). Daily garden use and quality of life in persons with advanced dementia living in a nursing home: A feasibility study. Nursing Open, 8(3), 1243–1253. https://doi.org/10.1002/nop2.740
11. van den Berg, M. E. L., Winsall, M., Dyer, S. M., Breen, F., Gresham, M., & Crotty, M. (2020). Understanding the barriers and enablers to using outdoor spaces in nursing homes: A systematic review. The Gerontologist, 60(4), E254–E269. https://doi.org/10.1093/geront/gnz055
12. Verbeek-Oudijk, D., & Koper, I. (2019). Het leven in een verpleeghuis. Landelijk overzicht van de leefsituatie, ervaren kwaliteit van leven en zorg van oudere verpleeghuisbewoners in 2019. Sociaal en Cultureel Planbureau. https://www.scp.nl/publicaties/publicaties/2021/02/19/het-leven-in-eenverpleeghuis.
13. Sociaal en Cultureel Planbureau, & Centraal Bureau voor de Statistiek. (2020). Ouderen in instellingen 2019 - OII 2019 version V1 DANS data station social sciences and humanities. https://doi.org/10.17026/dans-xvn-hqkv
14. Detweiler, M. B., Murphy, P. F., Kim, K. Y., Myers, L. C., & Ashai, A. (2009). Scheduled medications and falls in dementia patients utilizing a wander garden. American Journal of Alzheimer's Disease and other Dementias, 24(4), 322–332. https://doi.org/10.1177/1533317509334036

15. Murphy, P. F., Miyazaki, Y., Detweiler, M. B., & Kim, K. Y. (2010). Longitudinal analysis of differential effects on agitation of a therapeutic wander garden for dementia patients based on ambulation ability. Dementia, 9(3), 355–373. https://doi.org/10.1177/1471301210375336

16. Ettema, T. P., Droes, R.M., de Lange, J.,Mellenbergh, G. J., & Ribbe, M. W. (2007). Qualidem: Development and evaluation of a dementia specific quality of life instrument. Scalability, reliability and internal structure. International Journal of Geriatric Psychiatry, 22(6), 549–556. https://doi.org/10.1002/gps.1713

17. Bouman, A. I. E., Ettema, T. P.,Wetzels, R. B., van Beek, A. P. A., de Lange, J., & Dr¨oes, R. M. (2011). Evaluation of qualidem: A dementia-specific quality of life instrument for persons with dementia in residential settings; scalability and reliability of subscales in four Dutch field surveys. International Journal of Geriatric Psychiatry, 26(7), 711–722. https://doi.org/10.1002/gps.2585

18. Hosmer, D.W., Jr.,Lemeshow, S.,&Sturdivant,R.X. (2013).Assessing the fit of the model. In D. W. Hosmer, S. Lemeshow, & R. X. Sturdivant (Eds.), Applied logistic regression (pp. 153–225). John Wiley & Sons, Inc.. https://doi.org/10.1002/9781118548387.ch5

19. Brawley, E. C. (2007). Designing successful gardens and outdoor spaces for individuals with alzheimer's disease. Journal of Housing for the Elderly, 21(3-4), 265–283. https://doi.org/10.1300/J081v21n03_14

20. Kearney, A. R., & Winterbottom, D. (2006). Nearby nature and longterm care facility residents. Journal of Housing for the Elderly, 19(3-4), 7–28. https://doi.org/10.1300/J081v19n03_02

21. Pollock, A. M. M. (2012). Designing outdoor spaces for people with dementia. HammondCare Media. https://shop.hammond.com.au/products/designing-outdoor-spaces-for-people-with-dementia

22. Dyer, S. M., Liu, E., Gnanamanickam, E., Harrison, S. L., Milte, R., & Crotty,M. (2021). Associations between quality of life and outdoor access in nursing homes: A cross-sectional study. Annals of Long- Term Care, e1–e7. https://doi.org/10.25270/altc.2021.02.00001

23. Macháčová , K., Vaňková, H., Holmerová, I., Čábelková, I., & Volicer, L. (2018). Ratings of activities of daily living in nursing home residents: Comparison of self- and proxy ratings with actual performance and the impact of cognitive status. European Journal of Ageing, 15(4), 349–358. https://doi.org/10.1007/s10433-018-0456-5

24. Neumann, P. J., Araki, S. S., & Gutterman, E. M. (2000). The use of proxy respondents in studies of older adults: Lessons, challenges, and opportunities. Journal of the American Geriatrics Society, 48(12), 1646–1654. https://doi.org/10.1111/j.1532-5415.2000.tb03877.x

25. Howland, M., Allan, K. C., Carlton, C. E., Tatsuoka, C., Smyth, K. A., & Sajatovic, M. (2017). Patient-rated versus proxy-rated cognitive and functional measures in older adults. Patient Related Outcome Measures, 8, 33–42. https://doi.org/10.2147/prom.S126919

26. Ruggero, L., Croot, K., & Nickels, L. (2023). Quality of life ratings and proxy bias in primary progressive aphasia: Two sides to the story? American Journal of Alzheimer's Disease and Other Dementias, 38, Article 15333175231177668. https://doi.org/10.1177/15333175231177668

4

Daily garden use and quality of life in persons with advanced dementia living in a nursing home: A feasibility study

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ABSTRACT

Aim: To evaluate the process of daily going outside in a nursing home garden and explore the effect of garden use on quality of life and neuropsychiatric symptoms in persons with dementia.

Design: A feasibility study with quantitative and qualitative approaches.

Methods: Twenty residents with a diagnosis of moderate-to-severe dementia participated. The intervention consisted of at least 30 min of garden use, whereby any activity outside is possible as long as it is person-centred and fitting within usual daily nursing home practice. Interviews were held with caregivers, and questionnaires were sent to other disciplines involved. Quality of life (QUALIDEM) and neuropsychiatric symptoms (NPI-NH) were collected at baseline, intervention and postintervention.

Results: Caregivers experienced and observed benefits of going outside for themselves, in residents and relatives. Incorporating daily garden use does not imply an additional task, but rather rearranging priorities and doing the usual activities outside a part of the time.

WHAT DOES THIS PAPER CONTRIBUTE TO THE WIDER GLOBAL CLINICAL COMMUNITY?

- Daily going outside in the garden leads to positive effects on quality of life of persons with dementia living in a nursing home.
- Caregivers experienced and observed the benefits of going outside in residents, their relatives and for themselves.
- Incorporating daily going outside in a nursing home garden needs increase in knowledge, creating awareness and rearranging priorities of caregivers and other disciplines.

INTRODUCTION

Persons with dementia have a high disease burden and experience a major loss of QoL.[1, 2] The definition of dementia-specific QoL is "the multidimensional evaluation of the person-environment system of the individual, in terms of adaptation to the perceived consequences of the dementia".[3] Some of the aspects that influence QoL are behavioural and psychological symptoms of dementia (BPSD), for example agitation.[4, 5] BPSD is defined as "signs and symptoms of disturbed perception, thought content, mood and behavior".[5, 6] Nearly all persons with dementia will be affected by one or more symptoms during the course of their illness.[6, 7] Possible causes of the symptoms are neurobiologically related disease factors, unmet needs such as hunger or pain, caregiver factors and environmental triggers.[6]

BACKGROUND

Behavioural and psychological symptoms of dementia is very complex, and there is no "one-size-fits-all" solution to solve them.[6] However, there is consensus that, in general, non-pharmacological interventions are preferable to pharmacological interventions.[8] One of those non-pharmacological interventions is the passive and active use of gardens.[9] Design and proper use of the physical environment are increasingly recognized as an important factor in the care of persons with dementia.[10] Current guidelines recommend specific attention to the physical environment, including outside spaces.[11]

In recent years, attention for the positive effects of experiencing nature, that is the subjective perception and evaluation of natural elements in the environment, is increasing.[12] Research has shown that there are direct beneficial effects of nature on stress and indirect beneficial effects on physical activity and social contacts and therefore also on health and well-being, through contact with nature.[12] The systematic review of Nicholas et al. (2019) shows evidence of benefits of nature among older adults, particularly in long-term care facilities.[13] Significant improvement was found in QoL, anxiety, depression, social relations, and physical and cognitive abilities. Studies focusing on persons with dementia show a statistically significant decrease in agitation and significantly higher levels of engagement. However, the evidence lacks robustness.[13] Another more specific review about the influence of a natural environment on nursing home residents with dementia also found promising positive results.[14] The quantitative studies in this review suggested that garden use is associated with decreased levels of agitation. The findings from the qualitative studies revealed some themes around the views and experiences of the garden from the perspective of residents and staff and/or relatives, namely the presence of a garden allowed for relaxation and

could also stimulate activity and memories. It also provided a normalizing context for interactions with staff and visitors. Benefits of the garden were thought to occur through reminiscence and sensory stimulation.[14] However, most of the reviewed studies, both quantitative and qualitative, are of poor quality, due to high risks of bias and no (reporting of) valid data tools and the quality of analysis.[14] More evidence is needed to understand the mechanisms, barriers and facilitators involved in integrating the option of appropriate garden use in building new nursing homes or rebuilding existing ones and the implementation of garden use in the daily care of persons with dementia.

The objective of this study was to evaluate the process (usefulness, feasibility, applicability) of daily going outside in a nursing home garden and to explore the effect of garden use on QoL and neuropsychiatric symptoms in persons with advanced dementia. The research questions that will be answered are as follows: What is the effect of daily garden use on QoL and neuropsychiatric symptoms in persons with advanced dementia living in a nursing home? And what can be learned from the process of the implementation of this intervention? The results of this study will be used to develop an effect study.

METHODS

Setting and study population

The present feasibility study was conducted in a nursing home purposefully selected, because the entire staff was trained in person-centred care and it has a green garden suitable for persons with dementia. Person-centred care is a care approach built around the needs of an individual. It recognizes that all people are unique, with their own personal needs. The task of the caregivers is to be aware of behaviours that undermine the person's well-being (and to do that as little as possible) and enhance the person's well-being (and to do that as much as possible) to deliver optimum levels of care.[15, 16]

Residents with a diagnosis of moderate-to-severe dementia (Reisberg Global Deterioration Scale [GDS] ≥5) were eligible to participate.[17] The legal representatives of all 72 residents living in the participating nursing home were informed of the study via a letter explaining the purpose and procedures of the study. Legal representatives of the residents who objected to participation (opt-out, three residents), or participants who did not meet the inclusion criteria (one resident), were not enrolled in the study. This resulted in a population of 68 eligible residents. Participants were then selected by the researcher as follows: the names of all 68 residents were listed in alphabetical order per ward and then every 3rd, 6th, 9th and 12th resident was picked. In this way, a sample of 24 participants were randomly selected, that is four participants from each of the six wards.

Design and procedure
The description of the intervention is compliant with the Template for Intervention Description and Replication (TIDieR) checklist. The study is carried out within the Quality Framework Nursing Home Care and article 7 of the Quality, Complaints and Litigation Care Act (WKKGZ), both legal bases for the quality of nursing home care in the Netherlands, and was therefore exempt from Medical Research Ethics Committee approval.[11, 18]

The study design is presented in **Figure 1**. The study lasted 8 weeks: the first 2 weeks were the baseline period, between weeks 3–4 the intervention was implemented, weeks 5 and 6 were the intervention period and final measurements were carried out at the end of week 8.

During the baseline period (weeks 1–2), there were no instructions for the caregivers. During the implementation period (weeks 3–4), the researcher helped the caregivers, who were the primary coordinators of the intervention, to start planning the execution of the intervention. They could, for example, contact colleagues in other wards, other disciplines, relatives of the person with dementia and volunteers to make sure that there was someone to go outside in the garden with the participant every day during the intervention period (weeks 5–6). During the follow-up period (weeks 7–8), the wards received no instructions or suggestions. They could return to normal daily nursing home practice, continue with the intervention or something in between.

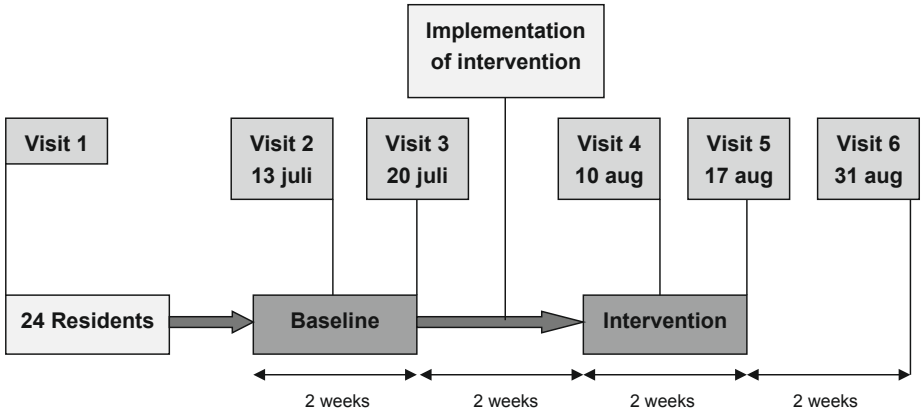

Figure 1. *Study design*

Data collection and materials
Data were collected at the end of the 1st, 2nd, 5th, 6th and 8th weeks. In the subsequent weeks, interviews were held with caregivers and questionnaires

were sent to other disciplines (psychologist, elderly care physician, occupational therapist, physiotherapist, Registered Nurse (RN), managers) involved in performing the intervention. The interviews focused on the process of and their experiences with the intervention.

Intervention

Based on the existing literature, we created a new practical, innovative intervention of garden use. The innovation lies in the fact that the care can be given to the residents in the garden instead of inside the nursing home building. Just being outside in the garden can strengthen person-centred care because garden use is beneficial for persons' quality of life and BPSD if it is tailored to the residents' wishes and preferences.[13, 19] The garden-use intervention consisted of going outside for at least 30 min in the nursing home garden, whereby any activity is possible as long as it is person-centred and fits within the usual activities in daily nursing home practice. These 30 min are based on the research of White et al. (2018) who found that improvements in mood were associated with 20 min of being outside, with benefits increasing up to 80–90 min.[19] If more time was spent outside, the beneficial effects decreased.[19] Examples of outdoor activities are sitting outside, walking in the garden, talking about the garden, drinking a beverage, having lunch and doing an activity such as reminiscence, a game or gardening.

Process evaluation

To evaluate the usefulness, feasibility and applicability of the implementation of the intervention, qualitative data were obtained via:

1. Notes and memos describing the process of the study during the study period.
2. Interviews with caregivers focusing on the usefulness, feasibility, applicability and their experiences. The interviews were conducted by the researcher and took place at the ward using a topic list to structure the interview. Examples of questions are as follows: "What did you like/dislike about the process/going outside with the persons with dementia?", "What would you do differently in the process/going outside with the persons with dementia?" and "How can going outside for at least 30 min every day with the persons with dementia be made feasible?".
3. Questionnaires completed by other disciplines involved focusing on the process and experiences. The questionnaires were sent by e-mail with a short instruction. The questionnaires were a short version of the topic list of the interviews.
4. Participant diaries where details were recorded during the intervention period (e.g. positive and negative feedback, type of activities, time spent outside).

Usefulness was defined by the degree of how useful this intervention was and what this intervention meant for the daily nursing home practice; feasibility by how feasible this intervention was for the daily nursing home practice and how easy

or hard it was to execute the intervention; and applicability by how capable this intervention was to apply in daily nursing home practice.

For analysis of the qualitative data, thematic analysis was applied. The data were coded according to the themes: usefulness; feasibility; and applicability. Within these themes, the data were further examined and coded to identify subthemes.

Outcome measures

Quality of life
QoL was measured with the QUALIDEM short version, which includes 18 items that are applicable even to patients with very severe dementia (GDS 7) in six QoL domains (care relationships, positive affect, negative affect, restless tense behaviour, social relations and social isolation). The caregivers score the items after an observation period of a week. Each item ranges from 0 (never)–3 (often). The scoring is done per domain. A higher score equals higher QoL.[20, 21] The QUALIDEM has satisfactory reliability (rho ranging from .60–.90) and validity (Cronbach's alpha ranging from .59–.89).[21, 22]

Neuropsychiatric symptoms
Neuropsychiatric symptoms were measured with the Neuropsychiatric Inventory-Nursing Homes (NPI-NH), which assesses 12 neuropsychiatric symptoms: delusions, hallucinations, agitation/aggression, depression/dysphoria, anxiety, elation/euphoria, apathy/indifference, disinhibition, irritability/lability, aberrant motor behaviour, sleep and night-time behaviour disorders and appetite and eating disorders. It is based on an interview with the professional caregivers, and in this study, the items are scored after an observation period of one week. The Dutch version of the NPI-NH has high inter-rater agreement, good construct validity and can be scored objectively.[23, 24] Symptoms are each rated with frequency and severity scores. Frequency ranges from 1 (sometimes)–4 (very often), and severity ranges from 1 (mild)–3 (severe). Each symptom is scored by frequency*severity scores. Summing up these 10 scores (sleep and night-time behaviour disorders and appetite and eating disorders are not included) will create a total score, ranging from 0 (no symptoms at all)–120 (all symptoms at every moment).[25] In addition, based on the study of Selbaek and Engedal (2012), eight of the domains were clustered into three factors, namely psychosis (delusions, hallucinations), agitation (agitation/aggression, disinhibition, irritability/lability) and affective symptoms (depression/dysphoria, anxiety).[26]

Additional measurements

The following additional measurements were done to describe the characteristics of the participants. Information on number of falls, use of psychotropics and type of outdoor activities was reported in daily nursing records and collected during each study visit. Information on sociodemographic characteristics of participants (age, gender, dementia severity and type of dementia) was obtained at baseline. Dementia severity was assessed with the Reisberg Global Deterioration Scale (GDS). The GDS is an assessment tool that rates stages of cognitive decline, with scores from 1 (no cognitive decline)–7 (very severe cognitive decline).[17]

Statistical analysis

Descriptive statistics include the mean and standard deviation when variables were normally distributed and the median and interquartile range for non-normally distributed variables. The total possible days outside (N = 12) divided by the actual days going outside or refused to go outside were given in percentages. Differences between baseline and intervention and between intervention and follow-up were analysed using the t test for normally distributed variables and the Wilcoxon signed-rank test for non-normally distributed variables. Paired-samples t tests were conducted to evaluate the impact of the intervention on quality of life and neuropsychiatric symptoms. A p-value <.05 was considered statistically significant.

All analyses were performed with SPSS statistical software, version 23, 2015 (SPSS Inc, IBM, Chicago, IL).

RESULTS

Process evaluation

Table 1 shows an overview of the number of days and percentages the participants went in the garden during the intervention period and who accompanied them. There were some differences between the wards; the lowest rate of being outside was 12.5%, and the highest, 56.3%. The average of all wards was 25.4%. The participants went outside with the caregivers, recreational therapists, relatives and volunteers. Unfortunately, it was often not recorded who facilitated the intervention, although the researcher was told that it was mostly relatives.

Table 1. *Days outside or refused (N=12) in frequencies and percentages per participant, mean days outside and refused per ward, and persons who facilitate the intervention other than the usual professional caregivers*

Participant	Ward	Days outside (*f*)	Days outside (%)	Days refused (*f*)	Days refused (%)	Persons who facilitate the intervention other than the usual professional caregivers
1	1	4	33.33	0	0.00	Volunteers, UNK
2	1	3	25.00	0	0.00	Volunteers, UNK
3	1	0	0.00	4	33.33	-
4	1	3	25.00	1	8.33	Volunteers, relatives
	M	2.50	20.83	1.25	10.42	
5	2	4	33.33	0	0.00	Relatives
6	2	1	8.33	1	8.33	UNK
7	2	1	8.33	0	0.00	UNK
8	2	0	0.00	1	8.33	-
	M	1.50	12.50	0.50	4.17	
9	3	5	41.67	0	0.00	UNK
10	3	11	91.67	0	0.00	UNK
11	3	5	41.67	0	0.00	UNK
12	3	6	50	0	0.00	UNK
	M	6.75	56.30	0	0.00	
13	4	2	16.67	0	0.00	Relatives
14	4	3	25.00	0	0.00	Relatives
15	4	0	0.00	0	0.00	-
16	4	6	50	0	0.00	Relatives
	M	2.75	22.92	0	0.00	

Table 1. *Continued*

Participant	Ward	Days outside (*f*)	Days outside (%)	Days refused (*f*)	Days refused (%)	Persons who facilitate the intervention other than the usual professional caregivers
17	5	1	8.33	3	25.00	UNK
18	5	1	8.33	0	0.00	Relatives
19	5	4	33.33	0	0.00	UNK
20	5	1	8.33	1	8.33	UNK
	M	1.75	14.58	1	8.33	
Total	*M*	3.05	25.42	0.60	4.58	

Note. Reasons participants refused to go outside was given once: "doesn't like to go outside".
Abbreviation: UNK, unknown.

Usefulness
Participation in this study led to an increase in knowledge about the positive effects of being outside in general and on persons with dementia in particular and created awareness of how often residents actually go in the garden:

"It was good to take a moment and be aware of (the frequency of) going outside with the residents and this awareness generated an increased effort to actually go outside, instead of only opening the doors. It brought attention to the importance of going outside and the potential opportunities to go outside, even in bad weather." (caregiver)

In addition, the caregivers realized that in the approach of person-centred care, it is not necessary to do major activities outside and that being a coordinator empowered the caregivers:

"It was good to be aware that you don't have to do major activities. Small activities, fitting within the daily nursing home practice, like having a beverage, was also part of going outside." (caregiver)

"It 'forced' some of the older caregivers, who are used to working in a specific way, to be more flexible and open to new ideas and possibilities." (caregiver)

Caregivers experienced and observed the benefits of going outside for themselves, in the residents and relatives, for themselves for example by feeling more relaxed, having better communication and a better relationship with the person with dementia. The intervention was observed to be positive for the persons with dementia through improved reminiscence, less agitated behaviour, a new positive habit and being more awake during the day. And the relatives show the benefits for example by giving positive feedback about writing in the diary:

"It was nice and relaxing to be outside while working. It felt less rushed and it felt more pleasant, a feeling of having more time. The fresh air was nice. It was easier to communicate with the residents. It was easier to take the time during a conversation and give the residents time to think and wait for the answer. I enjoyed the residents who enjoyed themselves while being outside." (caregiver)

"I was getting to know the residents in a different way. The residents talked more easily and did activities more easily. They seemed to remember more of the past and talked about their memories." (caregiver)

"One time, going outside was used as an intervention. A resident showed a high level of agitation and nothing seemed to help her. After being outside in the garden with

a caregiver for only 30 min, this resident showed a completely different mood. She was relaxed and even willing to accept some physical care to her feet." (caregiver)

"*Writing in the diary was a positive experience for some relatives, as if they could get something off their chest. Relatives thought it was important that the residents go outside.*" (caregiver)

It was considered positive that the residents had a different, more peaceful environment in the garden:

"*There are fewer people and the people who are outside, are at a greater distance. The garden also provided other, more multisensory stimuli and fresh air, than the inside environment. There are more little things to see, like for example a butterfly, which can start a conversation. Or they know about certain things in the garden and they can share this knowledge. The (warmth of the) sun is very important and calming for the residents.*" (caregiver)

Feasibility

The caregivers were ambivalent about the feasibility of the intervention. Some said it was feasible:

"*It didn't take more time to go outside, because all wards had safe gardens or balconies adjacent to the living rooms. Instead of bringing someone to the table in the living room, we could bring the residents outside to the table, or onto the balconies. We had positive experiences with relatives and had few difficulties with planning the intervention.*" (caregiver)

Others experienced it as an additional task:

"*There were often only one or two caregivers in each ward that did all the work. We had a hard time convincing other caregivers to be actively engaged with the study. These caregivers were less flexible accepting a different perspective on the process of caring. The going outside was seen as an additional task, instead of rearranging priorities and doing the usual work outside part of the time. We were also disappointed that few relatives tried to actively carry out the intervention. For example, relatives didn't want to commit to certain days to go outside with their relative. So it was difficult to plan the intervention weeks.*" (caregiver)

In general, understaffing and a heavy workload made performing the intervention and going outside a challenge. Communication between researcher and caregivers and between caregivers was difficult due to miscommunication and lack of time or motivation on the part of the caregivers. There was also the daily administrative

work that is mostly done on the computer, that is indoors. That makes the caregivers less flexible in the daily process to go outside.

For some caregivers outside represented more danger than inside, for example when a resident frequently forgets to walk with the rollator, or to be aware of slippery stones, or eats flowers:

"*There has to be some kind of supervision, but that can also be done from inside the ward, regularly looking outside.*" (caregiver)

Applicability
Although it was certainly important that the caregivers and other disciplines in this study were trained in person-centred care and that the nursing home had a green garden suitable for persons with dementia, it turned out that the success of the intervention was determined by more factors. The first goal should be to generate motivation and expertise in all involved caregivers, disciplines, management, relatives and volunteers. When the whole team is willing to participate, the start of implementation of the intervention can be planned:

"Going outside is not just an activity, but a major process of increasing awareness and acceptance that going outside is just as much an obligation for the caregivers (and other disciplines) as good care of wounds is and that process takes time." (Psychologist)

Another very important factor that affects the implementation of the intervention is a close collaboration between the team manager, psychologist and nurses involved. The implementation period, as well as the intervention period, also needed more elaboration than originally planned. The caregivers needed more time and support to answer the question what could be done differently—with the same resources—to create the opportunity to go outside on a daily basis (e.g. drinking coffee in the garden instead of in the living room):

"*We need more time to communicate with each other, contact relatives and plan the intervention period.*" (caregiver)

"*We want more support from other disciplines, management and the researcher.*" (caregiver)

"*Specific agreements should be made and the team manager has to ensure that the agreements are met.*" (caregiver)

Outcome measures

Study population

One ward was unable to execute the various parts of the study due to understaffing and heavy workload, so 4 of the 24 selected participants could not participate, resulting in a final study population of 20 participants for evaluation in this study. Of the 20 included participants, 13 were female and the mean age was 85.2 years (standard deviation (SD): 4.92 years). See **Table 2** for the baseline characteristics of the participants.

Table 2. *Baseline characteristics of the study population (N = 20)*

	N	**%**
Female	13	65
Mean age (SD)	85.2	(4.9)
Global Deterioration Scale (GDS)		
5 = Moderate dementia	10	50
6 = Moderately severe dementia	7	35
7 = Severe dementia	3	15
Type of dementia		
Alzheimer's disease	7	35
Vascular dementia	5	25
Mixed dementia (AD/VD)	3	15
Not otherwise specified	5	25
Use of psychotropic medication total	12	60
Hypnotics (benzodiazepines)	9	
Antidepressants	7	
Antipsychotics	3	
Anti-dementia medication	1	

Abbreviations: SD, standard deviation, AD, Alzheimer's disease; VD, vascular dementia.

Quality of life

The mean scores of the QUALIDEM domains at baseline, intervention and follow-up are presented in **Table 3**. The domain positive affect showed a statistically significant increase between baseline and intervention period: mean 7.80 (SD 2.08) and mean 8.90 (SD 1.78), respectively, p = .002. This means an increase in positive affect of 1.10 points (95% confidence interval (CI) 0.46–1.74). In the social isolation domain, a statistically significant positive effect was found between baseline and intervention period, mean 5.73 (SD 1.45) and mean 6.38 (SD 1.60), respectively, p = .047.

Table 3. *Results of NPI-NH, QoL and falls at baseline, intervention and follow-up period (N=20)*

	Baseline		Intervention			Follow-up (*n*=12)		
	M	***SD***	***M***	***SD***	***p***	***M***	***SD***	***p***
NPI-NH Total (0-120)	9.10	8.45	8.88	6.65	.913	7.75[a]	7.88	.168
Psychosis (0-24)	0.68[a]	1.23	0.95[a]	2.82	1.00	1.00[a]	1.85	.655
Agitation (0-48)	4.33	4.59	4.03[a]	4.60	.900	3.00	4.24	.307
Affective symptoms (0-24)	2.50[a]	3.42	2.15[a]	2.81	.669	1.50[a]	2.98	.273
QUALIDEM								
Care relationship (0-9)	6.43	2.15	6.80[a]	1.74	.288	6.92[a]	1.98	.572
Positive Affect (0-12)	7.80	2.08	8.90	1.78	.002**	9.33[a]	3.08	.384
Negative Affect (0-6)	3.90	1.41	3.70	1.57	.460	4.17	1.75	.032*
Restless tense behavior (0-9)	6.15	2.22	5.65	2.02	.391	6.83[a]	2.37	.057
Social Relations (0-9)	6.35	1.91	6.85	1.44	.212	7.50	1.51	.740
Social Isolation (0-9)	5.73	1.45	6.38	1.60	.047*	7.00	1.65	.806
Number of falls	4		2			0		

Note. All falls happened inside the nursing home building.

[a] Distribution of scores was not normal, but for reasons of readability only means and standard deviations are shown.

*$p < .05$; **$p < .01$

This is an increase of 0.65 points (95% confidence interval (CI): 0.01–1.29). In the domain negative affect, a statistically significant positive effect was found between the intervention and follow-up period, mean 3.70 (SD 1.57) and mean 4.17 (SD 1.75), respectively, p = .032. This is an increase of 0.63 points (95% confidence interval (CI): 0.06–1.19). No significant differences were found for the domains care relationship, restless tense behaviour and social relations.

Neuropsychiatric symptoms
For the participants' total and cluster scores of the NPI-NH, we found no significant differences between baseline, intervention and follow-up (see **Table 3**).

Type of activities
The frequency of activities as described in the diaries is presented in **Table 4**, with the most frequently carried out activities are at the top of the table. Various activities could be done at the same time (e.g. sitting and having a beverage) but are presented separately. Most activities were usual activities in daily nursing home practice, such as sitting (21 times), walking (15 times) and having a beverage (12 times). There were a few planned activities (e.g. going to the beach), which were planned before the start of the study by recreational therapists.

Table 4. *Frequency of activities as described in the diaries*

Activity	Frequency
Sitting (often in the sun or shade)	21
Walking (mostly sitting in wheelchairs, or using rollator)	15
Having a beverage (coffee, tea, ice cream, fruit)	12
Planned activities ("garden group" "going to the beach" "the greenhouse")	10
Playing games (table shuffleboard, Rummikub)	7
Talking (about the environment, f.e. the kitchen garden, animals, flowers)	6
Looking at the environment (kitchen garden, animals, flowers)	5
Being outside not otherwise specified	5
Singing	2
Listening to music	2
Feeding the animals	1
ADL (cutting nails)	1

Abbreviations: ADL, activities of daily living.

DISCUSSION

Process evaluation

Usefulness
Participation in this study led to an increase in caregivers' knowledge about the positive effects of being outside in general and on persons with dementia in particular and created awareness of the frequency of residents actually going outside. Caregivers experienced and observed the benefits of going outside for themselves, in the residents and relatives. It was considered positive that the residents had a different, more peaceful environment in the garden.

Feasibility
The caregivers were ambivalent about the feasibility of the intervention. Some said it was feasible, and others experienced it as an additional task. In general, understaffing and heavy workload presented a challenge. Communication between researcher and caregivers and between caregivers themselves was difficult due to miscommunication and lack of time or motivation of the caregivers. There was also the daily administrative work, that is mostly done on the computer, that is inside, that makes the caregivers less flexible in the daily process to go outside.

Applicability
Besides person-centred care and a green garden suitable for persons with dementia, other important factors that influenced the implementation of the intervention were the duration and elaboration of each period of the intervention. There simply was not enough time and therefore opportunity to implement the intervention sufficiently. Also, the degree of collaboration with the involved team manager, psychologist and nurses was an important factor.

Outcome measures

This feasibility study shows that some domains of QoL improved between the period of normal daily nursing home practice and the period of going outside in the garden. The participants showed an increase in positive affect and a decrease in social isolation during the intervention period. This indicates that incorporating going outside in a garden daily in everyday nursing home practice can have a beneficial effect on the QoL of persons with advanced dementia.

Also, the participants showed a decrease in negative affect during the follow-up period where no instructions were given. This may be a delayed positive effect of the intervention, or a positive effect of the follow-up period. As it is unclear how the follow-up period was executed by the wards, it is not possible to draw any conclusions about this outcome.

Furthermore, our study showed that most activities were usual activities in daily nursing home practice, such as sitting, walking and having a beverage. This indicates that incorporating going outside in a nursing home garden does not have to involve doing an additional task but is about rearranging priorities and doing the usual work outside for a proportion of the time.

Although it is difficult to make meaningful comparisons to other studies due to different interventions and outcome measures, our findings do generally support previous studies, which found positive effects of garden use in persons with dementia. For example, a pilot study by Goto et al. (2014) where the participants were exposed to either a garden or Snoezelen room during a period of time showed positive behavioural changes in the garden-viewing group, whereas the response of the participants in the Snoezelen group was more negative.[27] During the 15 min in the garden, the participants' mean pulse rate was significantly less than in their residential room, whereas little or no change was detected in the Snoezelen room.[27] In the 1-year study by Connel et al. (2007), participants participated in either an outdoor or indoor activity program, both with a horticultural focus.[28] The outdoor activity group experienced significant improvements in maximum sleep duration and in verbal agitation.

Strengths and limitations

One of the strengths of this study is the use of outcome measures specifically designed for persons with dementia. In addition, the fact that it was a feasibility study enabled the researcher to be flexible in the execution of the protocol, while enough information was gained in the process to further develop the intervention for more comprehensive studies.

Some limitations should be considered. First, the sample size was small. However, this study shows that daily going outside in a nursing home garden improved some aspects of QoL. Also, these findings are of value to the limited number of studies investigating the effect of going outside on QoL of persons with dementia.

Second, the intervention was done during the summer holiday season. Although the weather was perfect for going outside, many of the caregivers were on vacation. This understaffing caused extra stress for the remaining caregivers and increased their workload.

Third, no measurements were done on the number of days the participants went outside during the baseline period. Although the caregivers said in the interviews that the participants were outside more than usual, the exact difference in percentages of being in the garden during baseline and intervention period is not known.

Implications for practice
In future research, each period in the study should be more elaborate and fit within the normal structures of the organization and wards. For example, the researcher can join existing work meetings to spread information, guide and collaborate with the caregivers, but also the other disciplines. Good implementation makes it is possible to embed going outside in daily nursing home practice. By joining existing routines, rearranging priorities and doing some of the regular work outside, the workload that comes with participating in the study for the caregivers will increase very little.

CONCLUSION

The present feasibility study shows that incorporating daily garden use does not have to involve doing an additional task but can be realized by rearranging priorities and doing the usual work outside part of the time. It leads to increased positive affect and less social isolation in persons with dementia. However, going outside is not just an activity, it is a major process of becoming aware and accepting that going outside is an obligation for the caregivers (and other disciplines) just as much as good care of wounds and this process takes time.

RELEVANCE TO CLINICAL PRACTICE

This study contributes to the current knowledge of the mechanisms, barriers and facilitators involved in the implementation of garden use in the daily care of persons with dementia and should inform decisions about daily nursing home practice.

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Data Availability Statement
Data made available to all interested researchers upon request via the last author.

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REFERENCES

1. Alzheimer Nederland. (2018). Cijfers en feiten over dementie. Retrieved from https://www.alzheimernederland.nl/sites/ default/files/directupload/facts heet-dementie-algemeen.pdf
2. Alzheimer Nederland & Vilans. (2013). Zorgstandaard dementie. Retrieved from https://www.vilans.nl/docs/vilan s/publicaties/Zorgstandaard_Dementie.pdf
3. Ettema, T. P., Dröes, R. M., de Lange, J., Ooms, M. E., Mellenbergh, G. J., & Ribbe, M. W. (2005). The concept of quality of life in dementia in the different stages of the disease. International Psychogeriatrics, 17(3), 353–370. https://doi.org/10.1017/s1041 61020 5002073
4. Banerjee, S., Samsi, K., Petrie, C. D., Alvir, J., Treglia, M., Schwam, E. M., & del Valle, M. (2009). What do we know about quality of life in dementia? A review of the emerging evidence on the predictive and explanatory value of disease specific measures of health related quality of life in people with dementia. International Journal of Geriatric Psychiatry, 24(1), 15–24. https://doi.org/10.1002/gps.2090
5. Finkel, S. I., Costa e Silva, J., Cohen, G., Miller, S., & Sartorius, N. (1996). Behavioral and psychological signs and symptoms of dementia: A consensus statement on current knowledge and implications for research and treatment. International Psychogeriatrics, 8, 497–500. https://doi.org/10.1017/s104161029 7003943
6. Kales, H. C., Gitlin, L. N., & Lyketsos, C. G. (2015). Assessment and management of behavioral and psychological symptoms of dementia. BMJ, 8003, 350–369. https://doi.org/10.1136/bmj.h369
7. Lyketsos, C. G., Carrillo, M. C., Ryan, J. M., Khachaturian, A. S., Trzepacz, P., Amatniek, J., Cedarbaum, J., Brashear, R., & Miller, D. S. (2011). Neuropsychiatric symptoms in Alzheimer's disease. Alzheimer's & Dementia, 7(5), 532–539. https://doi.org/10.1016/j.jalz.2011.05.2410
8. Seitz, D. P., Brisbin, S., Herrmann, N., Rapoport, M. J., Wilson, K., Gill, S. S., Rines, J., Le Clair, K., & Conn, D. (2012). Efficacy and feasibility of nonpharmacological interventions for neuropsychiatric symptoms of dementia in long term care: A systematic review. Journal of American Medical Directors Association, 13(6), 503–506. https://doi.org/10.1016/j.jamda.2011.12.059
9. Abraha I., Rimland J. M., Trotta F. M., Dell'Aquila G., Cruz-Jentoft A., Petrovic M., Gudmundsson A., Soiza R., O'Mahony D., Guaita A., Cherubini A. (2017). Systematic review of systematic reviews of non-pharmacological interventions to treat behavioural disturbances in older patients with dementia. The SENATOR-OnTop series. BMJ Open, 7, (3), e012759. http://dx.doi.org/10.1136/bmjopen-2016-012759
10. Day, K., Carreon, D., & Stump, C. (2000). The therapeutic design of environments for people with dementia: A review of the empirical research. The Gerontologist, 40(4), 397–416. https://doi.org/10.1093/geron t/40.397
11. Zorginstituut Nederland. (2017). Kwaliteitskader verpleeghuiszorg. Retrieved from https://www.zorginstituutnederland.nl/publicaties/publicatie/ 2017/01/13/kwaliteitskader-verpleeghuiszorg
12. Hartig, T., Mitchell, R., de Vries, S., & Frumkin, H. (2014). Nature and health. Annual Review of Public Health, 35, 207–228. https://doi.org/10.1146/annur ev-publh ealth -03201 3-182443
13. Nicholas, S. O., Giang, A. T., & Yap, P. L. K. (2019). The effectiveness of horticultural therapy on older adults: A systematic review. Journal of American Medical Directors Association, 20(10), 1351.e1–1351.e11. https://doi.org/10.1016/j.jamda.2019.06.021
14. Whear, R., Coon, J. T., Bethel, A., Abbott, R., Stein, K., & Garside, R. (2014). What is the impact of using outdoor spaces such as gardens on the physical and mental well-being of those with dementia? A systematic review of quantitative and qualitative evidence. Journal of American Medical Directors Association, 15(10), 697–705. https://doi.org/10.1016/j.jamda.2014.05.013
15. Kitwood, T. (1997). Dementia reconsidered: The person comes first. Open University Press.
16. Mitchell, G., & Agnelli, J. (2015). Person-centered care for people with dementia: Kitwood reconsidered. Nursing Standard, 30(7), 46–50. https://doi.org/10.7748/ns.30.7.46.s47

17. Reisberg, B., Ferris, S. H., & Crook, T. (1982). The Global Deterioration Scale for assessment of primary degenerative dementia. The American Journal of Psychiatry, 139(9), 1136–1139. https://doi.org/10.1176/ajp.139.9.1136

18. Dutch Government (2019). Wet kwaliteit, klachten en geschillen zorg. Retrieved from https://wetten.overh eid.nl/BWBR0 03717 3/2019-01-01#Hoofd stuk2_Artikel7

19. White, P. C., Wyatt, J., Chalfont, G., Bland, J. M., Neale, C., Trepel, D., & Graham, H. (2018). Exposure to nature gardens has time-dependent associations with mood improvements for people with mid- and late-stage dementia: Innovative practice. Dementia, 17(5), 627–634. https://doi.org/10.1177/1471301217 723772

20. Ettema, T. P., de Lange, J., Dröes, R. M., Mellenbergh, G. J., & Ribbe, M. W. (2005). Manual Qualidem. A measurement instrument Quality of Life in people with dementia in residential care, version 1. Retrieved from https://www.trimb os.nl/docs/c418c 48f-0711-4f76-bd7a-ce637cfe86 2f.pdf

21. Ettema, T. P., Dröes, R. M., de Lange, J., Mellenbergh, G. J., & Ribbe, M. W. (2007). QUALIDEM: Development and evaluation of a dementia specific quality of life instrument. Scalability, reliability and internal structure. International Journal of Geriatric Psychiatry, 22(6), 549–556. https://doi.org/10.1002/gps.1713

22. Bouman, A. I., Ettema, T. P., Wetzels, R. B., van Beek, A. P., de Lange, J., & Dröes, R. M. (2011). Evaluation of Qualidem: A dementia-specific quality of life instrument for persons with dementia in residential settings; scalability and reliability of subscales in four Dutch field surveys. International Journal of Geriatric Psychiatry, 26(7), 711–722. https://doi.org/10.1002/gps.2585

23. Kat, M. G., de Jonghe, J. F., Aalten, P., Kalisvaart, C. J., Dröes, R. M., & Verhey, F. R. (2002). Neuropsychiatric symptoms of dementia: Psychometric aspects of the Dutch neuropsychiatric inventory (NPI). Tijdschrift Voor Gerontologie En Geriatrie, 33(4), 150–155.

24. Zuidema, S. U., de Jonghe, J. F., Verhey, F. R., & Koopmans, R. T. (2007). Neuropsychiatric symptoms in nursing home patients: Factor structure invariance of the Dutch nursing home version of the neuropsychiatric inventory in different stages of dementia. Dementia and Geriatric Cognitive Disorders, 24(3), 169–176. https://doi.org/10.1159/00010 5603

25. Cummings, J. L., Mega, M., Gray, K., Rosenberg-Thompson, S., Carusi, D. A., & Gornbein, J. (1994). The neuropsychiatric inventory: Comprehensive assessment of psychopathology in dementia. Neurology, 44(12), 2308–2314. https://doi.org/10.1212/wnl.44.12.2308

26. Selbaek, G., & Engedal, K. (2012). Stability of the factor structure of the neuropsychiatric inventory in a 31-month follow-up study of a large sample of nursing-home patients with dementia. International Psychogeriatrics, 24(1), 62–73. https://doi.org/10.1017/s1041 61021100086x

27. Goto, S., Kamal, N., Puzio, H., Kobylarz, F., & Herrup, K. (2014). Differential responses of individuals with late-stage dementia to two novel environments: A multimedia room and an interior garden. Journal of Alzheimer's Disease, 42(3), 985–998. https://doi.org/10.3233/jad-131379

28. Connel, B. R., Sanford, J. A., & Lewis, D. (2007). Therapeutic effects of an outdoor activity program on nursing home residents with dementia. Journal of Housing for the Elderly, 21(3–4), 195–209. https://doi.org/10.1300/j081v 21n03_10

5

The effect of a multicomponent garden use intervention on garden use, daily life and quality of life of people living with dementia in a nursing home. A pretest–posttest follow-up study with The Vitality Garden intervention

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Submitted

ABSTRACT

Objectives: To examine the effect of a multicomponent garden use intervention - incorporating physical, social and organizational environmental components - on garden use, daily life and quality of life (QoL) of people living with dementia in a nursing home.

Design: A pretest-posttest follow-up study.

Setting and Participants: People living with dementia in a nursing home in the Netherlands (T0: N = 55, T1: N = 54, T2: N = 51).

Methods: The Maastricht Electronic Daily Life Observation Tool was used to measure the frequency of garden use and daily life (physical environment, daily activities, social interaction and emotional well-being), and the QUALIDEM to measure QoL. All outcomes were observed during three study periods: During baseline, after one (post), and two (follow-up) years. Descriptive statistics and univariate tests were used for analyses.

Results: Immediately after the intervention, there was a slight improvement in garden use, which returned to baseline levels during follow-up. While using the new garden, participants spent less time on passive and meaningless activities, and more time on social activities compared to when not using the garden. Participants with moderate dementia used the garden significantly more, while those with severe dementia used it the least. Finally, significant QoL improvements were limited to social relations.

Conclusions and Implications: The garden use intervention showed some positive effects on garden use and daily life. Future multicomponent intervention research in the complex nursing home environment should integrate process and outcome evaluations to better understand how interventions are developed, executed, and implemented.

INTRODUCTION

Dementia is a syndrome that includes a variety of progressive, irreversible diseases, with neurocognitive impairments as the main symptom.[1, 2] Because of these impairments, people living with dementia become increasingly dependent on others and rely more heavily on their environment to fulfill their own needs.[3, 4] In the Netherlands, there are between 80,000 and 113,000 people living with dementia in nursing homes.[5, 6] Most of them spend their days inactive, and one third of the people living with dementia in nursing homes rarely or never go outside.[7, 8]

An increasing number of studies focus on the effects of going outside and garden use on people living with dementia in nursing homes. Overall, preliminary results suggest positive effects of garden use on QoL, neuropsychiatric symptoms, stress, sleep, and mood.[9, 10] It is worth noting that these studies mostly focus on evaluating the effects of purposefully designed therapeutic gardens.[10] For example, one study evaluated whether a therapeutic garden can improve the QoL of people living with dementia and their caregivers, and found significant improvements in QoL of the people living with dementia after the creation and use of the therapeutic garden.[11] Another study showed that when people living with dementia observed a Japanese garden with the door open, their physiological stress was reduced, which was reflected in a sustained decrease in the residents' pulse rate.[12] A narrative review of the creation of dementia-friendly gardens found an overall positive effect of a dementia-friendly garden on agitation, apathy and engagement, although concerns were raised about the methodological approaches.[13] Systematic reviews of the influence of a garden use on people living with dementia in nursing homes also found promising positive results regarding agitation, engagement, depression, mood, stress and medication.[14, 15]

Most therapeutic garden interventions focus only on changing the physical environment, such as the nursing home garden and building. However, for a successful implementation of garden use in the complex daily practice of the nursing home, more environmental aspects should change, such as the social and organizational environment.[10, 16-18] The theoretical framework of de Boer et al.[17] shows that the literature identifies three environmental components within nursing homes that affect the daily life and functioning of people living with dementia: Physical aspects (e.g., design), social aspects (e.g., interactions with staff), and organizational aspects (e.g., leadership). This means that if you want to change something, such as implementing garden use in daily nursing home practice, in the daily lives of people living with dementia, you need to focus your intervention and implementation strategies on all three of these aspects.

In this study, in co-creation with stakeholders, a multicomponent garden use intervention (i.e., the Vitality Garden) was therefore developed, incorporating physical, social, and organizational environmental components.[19] In addition to the research team, a project team was formed with stakeholders from nursing home B, including high- and mid-level leaders, opinion leaders, and implementation facilitators (location manager, strategic housing manager, garden and landscape architect, team managers/welfare manager, nurses, and (care) staff representatives). [20] The research team provided the necessary scientific knowledge based on literature and evidence-based practices, and together with the project team they developed the environmental components of the intervention to integrate garden use into daily nursing home practice. See **Appendix A** for the environmental components of the intervention.

To the authors' knowledge, no previous study regarding garden use in a nursing home population living with dementia has been conducted that addressed the physical, social, and organizational environmental components together in one intervention. Therefore, the present study aims to examine the effect of this multicomponent garden use intervention on garden use, daily life and QoL of people living with dementia in a nursing home. The following research questions will be addressed: "Is there a difference between a) the frequency of garden use, b) daily life (physical environment, daily activities, social interaction and emotional well-being), and c) QoL of people living with dementia before, after, and during follow-up of a multicomponent garden use intervention?".

METHODS

Setting and participant selection

This study was conducted in a large nursing home (B) located in the western part of the Netherlands. Within B, there are nine psychogeriatric wards (142 residents), three somatic wards (82 residents) and two screening wards (31 residents).

Seven psychogeriatric wards were selected in consultation with the location manager, stratified by floor (two wards on the ground floor, two wards on the first floor, and three wards on the third floor). Each ward consisted of 16 residents, with the exception of one ward that had 14 residents, for a total of 110 residents. Residents with a diagnosis of moderate to severe dementia (Reisberg Global Deterioration Scale [GDS] ≥5)[21] and who were not expected to die within three months or to receive 'end-of-life' care were eligible to participate.

The legal representatives of all 110 residents were informed of the study through a letter, explaining the purpose and procedures of the study. Legal representatives of the residents who objected to participation, or participants who did not meet the

inclusion criteria, were not enrolled in the study. This resulted in a population of 107 in 2022 , 110 in 2023, and 110 eligible residents in 2024. Eight residents per ward were then randomly selected (the names of all residents per ward were listed in alphabetical order and numbered, and then every resident with an odd number was selected (1, 3, 5, 7, 9, 11, 13, 15)), resulting in an annual sample of 56 participants.

The Leiden-The Hague-Delft Medical Ethical committee declared the study exempt from the Dutch Medical Research Involving Human Subjects Act (protocol nr. N 22-3016).

Design and procedure

This study has a pretest-posttest follow-up design. Data on garden use, daily life, QoL and sociodemographic characteristics of participants were collected in three groups and during three study periods: Baseline (T0: May-July 2022), post (T1: May-July 2023), and follow-up (T2: May-July 2024). To control for seasonal influences, all data were collected during the same months and thus seasons (spring/summer).

There were 27 observers, mostly practitioners (psychologists, occupational therapists, physical therapists, speech therapists, social workers, psychomotor therapists, spiritual therapists) but also nurses, carers, a team manager, policy officers of the nursing home organization, and an intern with a medical background, all trained and qualified to use the Maastricht Electronic Daily Life Observation Tool (MEDLO tool).[22] These observers were not involved in the direct care of the residents in the ward they were observing. The participants were observed on four different weekdays during two mornings and two afternoons. Observations took place between 10:00-17:00, divided in two time periods of 10:00-13:30 and 13:30-17:00.

In every observation session, each participant was observed three times per hour, with a maximum of 3.5 hours of observation per day. Each session was divided into ten twenty-minute observation periods. A maximum of eight participants were observed during an observation period. The order in which participants were observed within these twenty-minute slots was determined by a random number generator. Each participant was observed for one minute, after which the observer scored the categories of the MEDLO tool. Observations took place only in publicly accessible locations and not in the participants' private rooms when the door was closed. The observer had a passive role and did not interfere with the participants that were being observed, thereby minimizing the effect of the observer on the participants. Participants, (in)formal caregivers, and volunteers did not have to do anything different than usual on an observation day.

The QUALIDEM questionnaire and the sociodemographic characteristics were completed by the psychologist of the participant. The data were entered into a password-protected electronic environment.

Outcome measures

Garden use and daily life
Participants' garden use and daily life were assessed using the MEDLO tool, a tablet-based observational instrument.[22] The MEDLO tool assesses daily life by collecting ecological momentary assessments, where observations are carried out in the moment and in the context in which they occur, allowing researchers to study the interaction between several aspects of daily life and contextual factors.[23] Daily life is a dynamic and multidimensional concept that is more than activities alone.[22] The MEDLO tool measures four domains of daily life: physical environment, daily activities, social interaction, and emotional well-being.[22]

Each aspect of daily life was observed and scored using standardized scoring options, including the following categories: The most meaningful activity performed by or near the participant (32 possible activities, e.g., eating/drinking, domestic activities, sitting/lying down, other such as smoking), the participant's location during the activity (e.g., on the ward, in participant's own room, or outside), engagement in the activity (e.g., actively engaged, passively engaged, or no engagement), the level of social interaction (verbal and non-verbal) at that moment (ranging from no social interaction to interaction with two or more people), the type of social interaction (ranging from positive social to negative restrictive), the degree of physical effort displayed by the participant during the activity (ranging from lying still to full-body movements), the mood of the participant at that moment (ranging from strong signs of positive mood to strong signs of negative mood), the level of agitation of the participant based on the Pittsburgh Agitation Scale [24] (ranging from no agitation to extreme agitation), and whether or not there was a visitor with the participant (could be anyone, e.g., family, friends, other residents). For the Vitality Garden study, we added the garden-zone category, to score where in the garden of the nursing home the participant was when they were outside.

Agreement on the aspects of the MEDLO tool is high with an average absolute agreement of 86%.[22] Qualitative field notes were made to describe the context of the observation when the observer judged that this would add value to the data collected.

Quality of life
QoL was measured using the QUALIDEM short version.[25] It includes 18 items in six QoL domains (care relationships, positive affect, negative affect, restless tense behavior, social relations and social isolation) that are applicable to participants

with very severe dementia (GDS 7).[21] Each item ranges from 0 (never) to 3 (often). Scoring is per domain, with higher scores equaling better QoL. The QUALIDEM has satisfactory reliability (rho ranging from .60–.90) and validity (Cronbach's alpha ranging from .59–.89).[25, 26]

Additional measurements
Information on sociodemographic characteristics of the participants (gender, age, dementia severity and type of dementia) was collected from the electronic patient files by the ward psychologist. Dementia severity was assessed using the Reisberg GDS, an assessment tool that rates stages of cognitive decline, with scores ranging from 1 (no cognitive decline) to 7 (very severe cognitive decline).[21]

Statistical analysis
Analyses were performed using SPSS statistical software, version 29, 2022 (SPSS INC, IBM, Chicago, IL). Because of the long period of time between data collections, approaching the data at the participant level would exclude those who died or were expected to die within 3 months, and those who were newly admitted. Therefore, the authors decided to analyze at the group level so that participants who completed at least one data collection could be analyzed.

The items of the activity category of the MEDLO tool were grouped into nine clusters ((self) care activities, social activities, eating and drinking, outside activities, household activities, recreational activities, passive and meaningless activities, not observable activities, other activities). The categories location, engagement in activity, social interaction, and agitation were dichotomized. Garden zone was dichotomized to create the category garden use (no garden use/garden use). The categories type of social interaction, physical effort, and mood were trichotomized.

For the 'social interaction' category, only two-way interaction or interaction with more than one person were clustered into social interaction. The options no interaction, one-way interaction from the resident's perspective, and one-way interaction from someone else were clustered into no social interaction. The category 'type of social interaction' was scored when the options one-way interaction from someone else, two-way interaction or interaction with more than one person were scored in the category social interaction. Because of this, more momentary assessments are possible for the category 'type of social interaction' than the total number of momentary assessments of social interaction.

To explore possible differences in the characteristics of the study population across the three study periods the Pearson chi-square test for independence (gender, Reisberg GDS), and the independent-samples Kruskal-Wallis test (age) were used.

Descriptive statistics (numbers and percentages) were computed to examine the research questions a) "Is there a difference between the frequency of garden use, and b) daily life (physical environment, daily activities, social interaction and emotional well-being) of people living with dementia before, after, and during follow-up of The Vitality Garden intervention?". The independent-samples Kruskal-Wallis test (age, QUALIDEM) was used to examine research question c) "Is there a difference between QoL of people living with dementia before, after, and during follow-up of The Vitality Garden intervention?". A p-value of .05 was considered statistically significant.

Descriptive statistics were computed for all measurements; median and interquartile range were calculated for age and the domains of the QUALIDEM, and numbers and percentages were calculated for all other outcomes.

RESULTS

Study population

Table 1 presents the characteristics of the study population at baseline (T0): N = 55, post intervention (T1): N = 54, and follow-up (T2): N = 51. There were no significant differences between the three groups. At T0, 67.3% of participants were female compared to 59.3% at T1, and 56.9% at T2. The median age (T0: 85 years (IQR 75-92), T1: 83 years (IQR 74-91), and T2: 84 years (IQR 74-90)) was similar across the three study periods. Most of the participants had moderate (GDS = 5) or moderately severe (GDS = 6) dementia, and suffered from Alzheimer's disease (T0: 45.5%, T1: 35.2%, and T2: 37.3%).

Table 1. *Characteristics of the study population at baseline (T1), post intervention (T2), and follow-up (T3)*

Characteristics	Baseline (N = 55)	Post (N = 54)	Follow-up (N = 51)
Demographic variables			
Female, *n (%)*	37 (67.3)	32 (59.3)	29 (56.9)
Age in years, *median* (*IQR*)	85 (75-92)	83 (74-91)	84 (74-90)
Global Deterioration Scale (GDS), *n (%)*			
5 = Moderate dementia	20 (36.4)	24 (44.4)	20 (39.2)
6 = Moderately severe dementia	31 (56.4)	25 (46.3)	23 (45.1)
7 = Severe dementia	4 (7.3)	5 (9.3)	8 (15.7)
Type of dementia, *n (%)*			
Alzheimer's disease (AD)	25 (45.5)	19 (35.2)	19 (37.3)
Vascular dementia (VD)	8 (14.5)	7 (13.0)	2 (3.9)

Table 1. *Continued*

Characteristics	Baseline (N = 55)	Post (N = 54)	Follow-up (N = 51)
Mixed dementia (AD/VD)	5 (9.1)	7 (13.0)	9 (17.6)
Frontotemporal Dementia (FTD)	2 (3.6)	1 (1.9)	2 (3.9)
Lewy Body Dementia (LBD)	3 (5.5)	1 (1.9)	1 (2.0)
Not otherwise specified (DNOS)	9 (16.4)	15 (27.8)	13 (25.5)
Other[a]	3 (5.5)	4 (7.4)	5 (9.8)
Going outside			
Going outside, *n (%)*	28 (50.9)	31 (55.4)	18 (35.3)
Garden use, *n (%)*	9 (16.1)	25 (46.3)	8 (15.7)
Garden zone, *n (%)*			
Terrace	2 (3.6)	6 (10.7)	4 (7.8)
Garden room	1 (1.8)	5 (8.9)	0 (0.0)
Pond	5 (8.9)	5 (8.9)	4 (7.8)
Semi-private terraces	1 (1.8)	5 (8.9)	0 (0.0)
Kitchen garden	0 (0.0)	10 (17.9)	2 (3.9)
Quality of life			
QUALIDEM, *median* (*IQR*)			
Care relationship	6 (4-9)	7 (4.75-9)	7 (5-9)
Positive affect	10 (8-11)	9 (7-12)	9 (8-12)
Negative affect	5 (4-6)	6 (5-6)	6 (4-6)
Restless tense behavior	4 (1-8)	7 (2.75-9)	7 (5-9)
Social relations*	7 (4-8)	6 (4-8)	7 (5-9)
Social isolation	7 (5-9)	7.5 (5.75-9)	7 (6-9)

*p = .005
IQR: Interquartile range.
[a] Other = Korsakoff Syndrome, Parkinson's Dementia (PD), Multiple Sclerosis Dementia (MSD), Primary Progressive Aphasia (PPA)

Garden use and daily life

The total number of momentary assessments per resident varied over the three time periods due to missing assessments (T0: n = 2, T1: n = 9, and T2: n = 9), one participant moving to another ward (T0: n = 10), the death of participants during the observation period (T1: n = 50, and T2: n = 170), and illness of the observers (T2: n = 51). This resulted in 2,228 assessments at T0; 2,101 assessments at T1; and 1,998 assessments at T2 (see **Table 2**).

At baseline, 0.9% of the observed time was spent in the garden by 9 (16.1%) participants (see **Tables 1 and 2**). These numbers improved slightly during post-intervention measurements, with 3.3% of observed time spent in the garden by 25 (46.3%) participants. During follow-up these numbers declined again to 1.1% of observed time spent in the garden by 8 (15.7%) participants. Of the participants who were observed using the garden at least once, 40.6% had moderate dementia, 17.7% had moderately severe dementia, and 5.9% had severe dementia (see **Figure 1**), χ^2 (2, *n* = 160) = 13.6, *p* = .001.

The most used areas in the garden in all three study periods were the terrace (T0: 19.0%, T1: 21.4%, and T2: 50.0%) and (sitting by) the pond (T0: 38.1%, T1: 10.0%, and T2: 31.8%).

In addition, participants spent 93.1% (T0), 93.4%, (T1) and 96.4% (T2) of the observed time inside the ward or the nursing home building, and approximately half of the observed time on passive and meaningless activities (T0: 54.4%, T1: 52.3%, and T2: 49.2%). Observed time spent on social activities showed a slight increase at the post-intervention measurement (T0: 4.9%, T1: 10.1%, and T2: 4.3%).

Engagement in activities was more frequently observed at follow-up (79.4%), compared to baseline (70.3%) or post-intervention (70.2%). Overall, most participants were in a positive mood during all momentary assessments, showed very little agitation, and spent their day sitting or without physical effort, and without visitors.

Table 2. *Observations of daily life*

Observations	Baseline (n = 2,228) *n* of momentary assessments (%)	Post (n = 2,101) *n* of momentary assessments (%)	Follow-up (n = 1,998) *n* of momentary assessments (%)
Location			
Inside	1,942 (93.1)	1,809 (93.4)	1,724 (96.4)
Outside	144 (6.9)	127 (6.6)	64 (3.6)
Garden use	21 (0.9)	70 (3.3)	22 (1.1)
Garden zone			
Terrace	4 (0.2)	15 (0.7)	11 (0.6)
Garden room	3 (0.1)	9 (0.4)	0 (0.0)
Pond	8 (0.4)	7 (0.3)	7 (0.4)
Semi-private terraces	6 (0.3)	13 (0.6)	0 (0.0)
Kitchen garden	0 (0.0)	26 (1.2)	4 (0.2)

Table 2. *Continued*

Observations	Baseline (n = 2,228) *n* of momentary assessments (%)	Post (n = 2,101) *n* of momentary assessments (%)	Follow-up (n = 1,998) *n* of momentary assessments (%)
Activity			
(Self) Care activities	82 (3.7)	57 (2.7)	54 (2.7)
Social activities	110 (4.9)	213 (10.1)	86 (4.3)
Eating and drinking	234 (10.5)	230 (10.9)	245 (12.3)
Outside activities	48 (2.2)	42 (2.0)	11 (0.6)
Household activities	7 (0.3)	8 (0.4)	16 (0.8)
Recreational activities	154 (6.9)	128 (6.1)	179 (9.0)
Passive and Meaningless activities	1,211 (54.4)	1,098 (52.3)	984 (49.2)
Non-observable activities	365 (16.4)	303 (14.4)	410 (20.5)
Other activities	17 (0.8)	20 (1.0)	13 (0.7)
Engagement in activity			
Engagement in activity	1,166 (70.3)	1,139 (70.2)	1,152 (79.4)
Social Interaction			
Social interaction	356 (21.6)	402 (24.6)	370 (25.5)
Type of social interaction			
Negative	26 (5.5)	47 (9.9)	32 (6.9)
Neutral	34 (7.2)	20 (4.2)	18 (3.9)
Positive	409 (87.2)	407 (85.9)	415 (89.2)
Physical effort			
No level of physical effort	340 (20.8)	269 (16.8)	165 (11.5)
Sitting	1,083 (66.3)	1,088 (67.8)	1,018 (70.7)
More than sitting	211 (12.9)	248 (15.5)	256 (17.8)
Mood			
Negative	275 (16.7)	324 (19.9)	248 (17.1)
Neutral	427 (26.0)	288 (17.7)	233 (16.1)
Positive	940 (57.2)	1017 (62.4)	966 (66.8)
Agitation			
Agitation	123 (7.5)	131 (8.0)	80 (5.5)
Visitors			
Yes	125 (7.6)	109 (6.6)	104 (7.1)

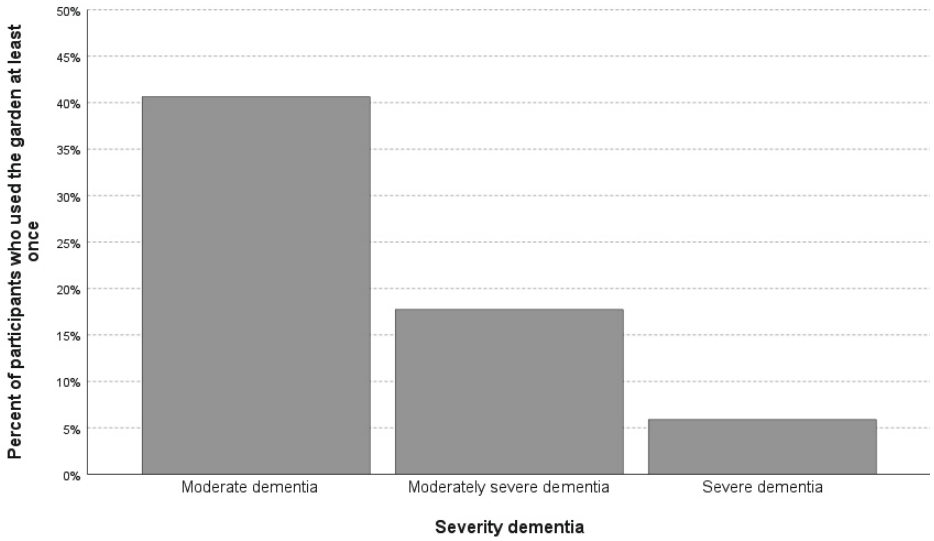

Figure 1. *Percentage of participants who used the garden at least once by dementia severity*

Garden use versus no garden use

Comparing assessments of daily life in participants while using the garden versus no garden use during the three study periods, we found a change in the percentages of momentary assessments of passive and meaningless activities and social activities during the post-intervention measurements (see **Table 3**). Almost half of the observed time (48.6%) was spent on social activities when using the garden, compared to only 8.8% when not using the garden. In addition, only 18.6% of the observed time was spent on passive and meaningless activities when using the garden, compared to 53.4% when not using the garden. Furthermore, we found a difference in the number of assessments of being engaged in activities during garden use versus no garden use in all three study periods. Engagement was higher while using the garden compared to no garden use.

Also, the number of assessments of social interaction and type of social interaction was higher during garden use than during no garden use in all three study periods. Notably, there was almost no observed time spent without some level of physical effort during garden use, compared to not using the garden.

In addition, the number of assessments of participants who had a visitor, were in a positive mood, and were not agitated during garden use was higher than during no garden use.

Table 3. *Observations of daily life during garden use versus no garden use*

Observations	Garden use					
	Baseline *n* of momentary assessments (%)		Post *n* of momentary assessments (%)		Follow-up *n* of momentary assessments (%)	
	Garden use (n = 21)	No garden use (n = 2,207)	Garden use (n = 70)	No garden use (n = 2,031)	Garden use (n = 22)	No garden use (n = 1,976)
Activity						
(Self) Care activities	0 (0.0)	82 (3.7)	1 (1.4)	56 (2.8)	0 (0.0)	54 (2.7)
Social activities	2 (9.5)	108 (4.9)	34 (48.6)	179 (8.8)	1 (4.5)	85 (4.3)
Eating and drinking	0 (0.0)	234 (10.6)	4 (5.7)	226 (11.1)	1 (4.5)	244 (12.3)
Outside activities	2 (9.5)	46 (2.1)	11 (15.7)	31 (1.5)	3 (13.6)	8 (0.4)
Household activities	0 (0.0)	7 (0.3)	0 (0.0)	8 (0.4)	0 (0.0)	16 (0.8)
Recreational activities	2 (9.5)	152 (6.9)	1 (1.4)	127 (6.3)	1 (4.5)	178 (9.0)
Passive and Meaningless activities	10 (47.6)	1,201 (54.4)	13 (18.6)	1,085 (53.4)	15 (68.2)	969 (49.0)
Not observable activities	3 (14.3)	362 (16.4)	0 (0.0)	303 (14.9)	0 (0.0)	410 (20.7)
Other activities	2 (9.5)	15 (0.7)	5 (7.1)	15 (0.7)	1 (4.5)	12 (0.6)
Engagement in activity						
Engagement in activity	15 (83.3)	1,151 (70.1)	66 (95.7)	1073 (69.1)	22 (100.0)	1,130 (79.1)
Social Interaction						
Social interaction	9 (50.0)	347 (21.3)	53 (75.7)	349 (22.3)	11 (50.0)	359 (25.2)
Type of social interaction						
Negative	0 (0.0)	26 (5.7)	2 (3.6)	45 (10.7)	0 (0.0)	32 (7.1)
Neutral	0 (0.0)	34 (7.4)	1 (1.8)	19 (4.5)	0 (0.0)	18 (4.0)
Positive	12 (100.0)	397 (86.9)	52 (94.5)	355 (84.7)	13 (100.0)	402 (88.9)

Table 3. *Continued*

Observations	Garden use					
	Baseline *n* of momentary assessments (%)		Post *n* of momentary assessments (%)		Follow-up *n* of momentary assessments (%)	
	Garden use (n = 21)	No garden use (n = 2,207)	Garden use (n = 70)	No garden use (n = 2,031)	Garden use (n = 22)	No garden use (n = 1,976)
Physical effort						
No level of physical effort	0 (0.0)	340 (21.0)	1 (1.4)	268 (17.5)	0 (0.0)	165 (11.6)
Sitting	15 (83.3)	1068 (66.1)	56 (80.0)	1032 (67.2)	17 (77.3)	1001 (70.6)
More than sitting	3 (16.7)	208 (12.9)	13 (18.6)	235 (15.3)	5 (22.7)	251 (17.7)
Mood						
Negative	0 (0.0)	275 (16.9)	3 (4.3)	321 (20.6)	0 (0.0)	248 (17.4)
Neutral	0 (0.0)	427 (26.3)	1 (1.4)	287 (18.4)	0 (0.0)	233 (16.4)
Positive	18 (100.0)	922 (56.8)	66 (94.3)	951 (61.0)	22 (100.0)	944 (66.2)
Agitation						
Agitation	0 (0.0)	123 (7.6)	2 (2.9)	129 (8.3)	0 (0.0)	80 (5.6)
Visitors						
Yes	4 (22.2)	121 (7.5)	30 (42.9)	79 (5.0)	8 (36.4)	96 (6.7)

Quality of life

The median scores of the QUALIDEM domains at baseline, post-intervention, and follow-up are presented in **Table 1**. The scores of all domains were similar across the three study periods, except for the domain social relations, χ^2 (2, n = 160) = 10.7, p = .005. Pairwise comparisons revealed a significant improvement between post intervention (T1); 6 (IQR 4-8), and follow-up (T2); 7 (IQR 5-9), with an adjusted significant level of p = .005.

DISCUSSION

The present study aimed to examine the effect of a multicomponent garden use intervention on garden use, daily life and QoL of people living with dementia in a nursing home. The results showed a slight improvement in garden use from 16.1% to 46.3% of the participants during post measurements, which decreased during follow-up to about baseline level. A previous study found that approximately two-thirds of people living with dementia in a nursing home go outside daily or once a week.[8] However, it is difficult to compare these numbers, because of the differences in study design and methods. The biggest differences are in generalizability (a large subsample of a national survey versus a moderate sample of one nursing home), and possible response bias (relying solely on proxy responses versus using a combination of observations and proxy responses).

The results of this study also showed a significant difference between dementia severity and garden use, with participants with moderate dementia using the garden the most, and participants with severe dementia using the garden the least. This seems to be consistent with the characteristics of people living with dementia in the different stages of dementia as described in the Reisberg GDS, where higher severity corresponds with higher and more severe impairments and dependency on the care environment.[21] In addition, a study exploring the characteristics associated with going outside among people living with dementia in nursing homes showed that the severity of physical impairment explained most of the variability in the frequency of going outside.[8] Taken together, these findings suggest that the more people living with dementia depend on the care environment, the less they are able to go outside. This underscores the importance of addressing dependency in interventions to promote garden use.

Looking at daily life while using the newly designed and realized garden, participants spent less time on passive and meaningless activities, and more time on social activities, in comparison to when they did not use the garden. One year after the realization of the garden, engagement in activities was also observed more frequently. These results are in line with the findings of earlier studies

that showed that participation in activities, engagement, and social connection improved while using the garden.[27]

Regarding QoL, a significant improvement was found between post intervention and follow-up for social relations. This is consistent with the above-mentioned result that participants have more social interaction when using the garden, and with other studies examining the effect of a garden use intervention on QoL.[28, 29] At the same time this result also differs from other research because no other significant differences were found, such as improvements in positive affect or social isolation.[30]

The lack of other effects on QoL and the decline in improvement of garden use during follow-up may be explained by implementation challenges and external factors. The intervention was based on scientific recommendations, integrating evidence-based practices with local needs.[17, 31] However, real-world factors can hinder the intended development and realization of the intervention.[32, 33] In the real-world context of this study, the emphasis was mainly on the physical environment. While the social and organizational aspects were initially considered, issues with care technology prevented their further development. As a result, there were no conversations to gather information about participants' needs and preferences for garden use. In addition, worsening weather conditions during follow-up —lower temperatures and increased rain and wind— may have contributed to the decline in improvement and lack of other effects.

This underscores the importance of considering the social and organizational environment for a successful implementation of garden use in the complex daily practice of nursing homes. [10, 16-18, 34] A study examining which characteristics of green care farms could be implemented in other long-term dementia care settings and how, found that it is important that the physical, social, and organizational environments support the process of change in order to realize innovation in dementia care settings.[18] In addition, a systematic review examining the barriers and facilitators that influence nursing home residents' use of outdoor spaces showed that besides specific design aspects, cultural change at the organizational level is also necessary, especially regarding perceptions of safety.[35]

Future research should combine process and outcome evaluations from the beginning to explore how the intervention was developed, executed, and implemented, and to identify which factors of the local real-world context may be associated with the outcomes.[33]

Limitations and strengths

Some limitations should be noted. First, due to the small number of momentary assessments of garden use, no statistical testing was possible to explore possible differences in daily life during garden use versus no garden use, and between the study periods T0, T1, and T2. In addition, the use of the MEDLO tool required observers to take a passive role in order to minimize interference with participants. However, it was found that some participants became aware of the presence of the observers, particularly when they walked by frequently in a short period of time because they were observing participants in different locations during the same observation session. This led to participants actively trying to communicate with the observers, suggesting a potential Hawthorne effect.

One of the strengths of this study is the use of outcome measurements specifically designed for people living with dementia. The MEDLO tool was also suitable for daily practice in the complex nursing home environment, because it captures the interaction between daily life and contextual factors.[22, 23] In addition, the combination of using observations and proxy responses with the QUALIDEM minimizes the possible effects of response biases.[36, 37] Furthermore, the use of a co-creation approach with stakeholders for the development of the multicomponent garden use intervention ensured that the intervention fit the local context of the nursing home.[19] This collaboration between researchers and stakeholders, and the integration of information from these different sources, can be the first step in the implementation of garden use, and may contribute to garden use becoming a regular part of daily nursing home practice.

CONCLUSIONS AND IMPLICATIONS

The results of this study suggest that the garden use intervention may have had positive effects on garden use and daily life. A temporary increase in garden use was observed immediately after the realization of the garden and in the peak of attention to the social and organizational aspects. Participants also spent less time on passive and meaningless activities, and more time on social activities while using the new garden than when not using the garden. In addition, participants with moderate dementia used the garden the most, and participants with severe dementia used it the least. Last, significant improvements in QoL were limited to social relations, with no other notable changes.

Implementation challenges and external factors, such as insufficient attention to social and organizational environmental components and bad weather, likely contributed to the decline in garden use during follow-up and to limited improvements in QoL. Future multicomponent intervention research in the complex nursing home environment should integrate process and outcome evaluations

in order to better understand how interventions are developed, executed, and implemented. In this context, prioritizing the role of care dependency in intervention design is essential to effectively encourage garden use.

Author contributions

Authors' specific areas of contributions:

- Study concept and design: Melanie van der Velde - van Buuringen, Hilde Verbeek, Wilco P. Achterberg, Monique A.A. Caljouw
- Analysis and interpretation of data: Melanie van der Velde - van Buuringen, Hilde Verbeek, Wilco P. Achterberg, Monique A.A. Caljouw
- Drafting of the manuscript: Melanie van der Velde - van Buuringen, Hilde Verbeek, Wilco P. Achterberg, Monique A.A. Caljouw
- Critical revision of the manuscript for important intellectual content: Melanie van der Velde - van Buuringen, Hilde Verbeek, Wilco P. Achterberg, Monique A.A. Caljouw

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REFERENCES

1. World Health Organization, *Fact-sheet Dementia*. 2023 15-03-2023 [cited 2024 04-04-2024]; Available from: https://www.who.int/news-room/fact-sheets/detail/dementia.
2. American Psychiatric Association, *Diagnostic and statistical manual of mental disorders (5th ed., text rev.)*. 2022.
3. Cipriani, G., et al., *Daily functioning and dementia.* Dement Neuropsychol, 2020. 14(2): p. 93-102.
4. World Health Organization, *UN Decade of Healthy Ageing: Plan of Action (2021–2030)*. 2020 [cited 2025 11-03-2025]; Available from: https://www.who.int/publications/m/item/decade-of-healthy-ageing-plan-of-action?utm_source=chatgpt.com.
5. Alzheimer Nederland, *Factsheet cijfers en feiten over dementie*. 2021.
6. Sociaal en Cultureel Planbureau and Centraal Bureau voor de Statistiek, *Ouderen in Instellingen 2019 - OII 2019*. 2020, DANS Data Station Social Sciences and Humanities.
7. den Ouden, M., et al., *Daily (In)Activities of Nursing Home Residents in Their Wards: An Observation Study.* J Am Med Dir Assoc, 2015. 16(11): p. 963-8.
8. Velde-van Buuringen, M.v.d., et al., *Which Characteristics are Associated With Going Outside for People Living With Dementia in Nursing Homes? A Cross-Sectional Study.* Journal of Applied Gerontology, 2024: p. 07334648241298107.
9. Nicholas, S.O., A.T. Giang, and P.L.K. Yap, *The Effectiveness of Horticultural Therapy on Older Adults: A Systematic Review.* Journal of the American Medical Directors Association, 2019. 20(10): p. 1351. e1-1351.e11.
10. Velde-van Buuringen, M.v.d., et al., *The effect of garden use on quality of life and behavioral and psychological symptoms of dementia in people living with dementia in nursing homes: a systematic review.* Frontiers in Psychiatry, 2023. 14.
11. Edwards, C.A., C. McDonnell, and H. Merl, *An evaluation of a therapeutic garden's influence on the quality of life of aged care residents with dementia.* Dementia (London), 2013. 12(4): p. 494-510.
12. Goto, S., et al., *The Positive Effects of Viewing Gardens for Persons with Dementia.* J Alzheimers Dis, 2018. 66(4): p. 1705-1720.
13. Motealleh, P., et al., *Creating a dementia-friendly environment through the use of outdoor natural landscape design intervention in long-term care facilities: A narrative review.* Health Place, 2019. 58: p. 102148.
14. Whear, R., et al., *What is the impact of using outdoor spaces such as gardens on the physical and mental well-being of those with dementia? A systematic review of quantitative and qualitative evidence.* J Am Med Dir Assoc, 2014. 15(10): p. 697-705.
15. Murroni, V., et al., *Effectiveness of Therapeutic Gardens for People with Dementia: A Systematic Review.* International Journal of Environmental Research and Public Health, 2021. 18(18): p. 24.
16. Grol, R. and M. Wensing, *What drives change? Barriers to and incentives for achieving evidence-based practice*. Medical Journal of Australia, 2004. 180(S6): p. S57-S60.
17. de Boer, B., et al., *The Homestead: Developing a Conceptual Framework through Co-Creation for Innovating Long-Term Dementia Care Environments.* International Journal of Environmental Research and Public Health, 2021. 18(1).
18. Buist, Y., et al., *Innovating dementia care; implementing characteristics of green care farms in other long-term care settings.* Int Psychogeriatr, 2018. 30(7): p. 1057-1068.
19. Greenhalgh, T., et al., *Achieving Research Impact Through Co-creation in Community-Based Health Services: Literature Review and Case Study.* Milbank Q, 2016. 94(2): p. 392-429.

20. Damschroder, L.J., et al., *The updated Consolidated Framework for Implementation Research based on user feedback.* Implementation Science, 2022. 17(1): p. 75.

21. Reisberg, B., Ferris, S. H., & Crook, T., *The Global Deterioration Scale for assessment of primary degenerative dementia.* The American Journal of Psychiatry, 1982. 139(9): p. 1136–1139.

22. de Boer, e.a., *Daily lives of residents with dementia in nursing homes: development of the Maastricht electronic daily life observation tool.* International Psychogeriatrics, 2016. 28(8): p. 1333–1343.

23. Shiffman, S., Stone, A. A. and Hufford, M. R., *Ecological momentary assessment.* Annual Review of Clinical Psychology, 2008. 4: p. 1-32.

24. Rosen, J., et al., *The Pittsburgh Agitation Scale: A User-Friendly Instrument for Rating Agitation in Dementia Patients.* The American Journal of Geriatric Psychiatry, 1994. 2(1): p. 52-59.

25. Ettema, T.P., et al., *QUALIDEM: development and evaluation of a dementia specific quality of life instrument. Scalability, reliability and internal structure.* International Journal of Geriatric Psychiatry, 2007. 22(6): p. 549-556.

26. Bouman, A.I.E., et al., *Evaluation of Qualidem: a dementia-specific quality of life instrument for persons with dementia in residential settings; scalability and reliability of subscales in four Dutch field surveys.* International Journal of Geriatric Psychiatry, 2011. 26(7): p. 711-722.

27. Ng, L., E. Oliver, and K. Laver, *Beyond garden design: A review of outdoor occupation in hospital and residential care settings for people with dementia.* Australian Occupational Therapy Journal, 2023. 70(1): p. 97-118.

28. Hendriks, I.H., et al., *Nature and dementia: development of a person-centered approach.* International Psychogeriatrics, 2016. 28(9): p. 1455-1470.

29. Evans, S.C., et al., *Connections with nature for people living with dementia.* Working with Older People, 2019. 23(3): p. 142-151.

30. van der Velde-van Buuringen, M., W.P. Achterberg, and M.A.A. Caljouw, *Daily garden use and quality of life in persons with advanced dementia living in a nursing home: A feasibility study.* Nurs Open, 2020.

31. Harms, L.S.E., et al., *Context matters-the phased development of an adaptable food literacy intervention: Up for Cooking.* Health Promot Int, 2023. 38(4).

32. Pieper, M.J.C., et al., *Implementation of a Stepwise, Multidisciplinary Intervention for Pain and Challenging Behaviour in Dementia (STA OP!): A Process Evaluation.* International Journal of Integrated Care, 2018.

33. Craig, P., et al., *Developing and evaluating complex interventions: The new Medical Research Council guidance.* International Journal of Nursing Studies, 2013. 50(5): p. 587-592.

34. Brouwers, M., et al., *Depressive Signs and Daily Life of Residents When Relocating From a Regular to an Innovative Nursing Home.* Journal of the American Medical Directors Association, 2024: p. 105298.

35. van den Berg, M.E.L., et al., *Understanding the Barriers and Enablers to Using Outdoor Spaces in Nursing Homes: A Systematic Review.* Gerontologist, 2020. 60(4): p. E254-E269.

36. Macháčová, K., et al., *Ratings of activities of daily living in nursing home residents: comparison of self- and proxy ratings with actual performance and the impact of cognitive status.* European Journal of Ageing, 2018. 15(4): p. 349-358.

37. Neumann, P.J., S.S. Araki, and E.M. Gutterman, *The use of proxy respondents in studies of older adults: lessons, challenges, and opportunities.* J Am Geriatr Soc, 2000. 48(12): p. 1646-54.

APPENDIX A

The effect of a multicomponent garden use intervention on garden use, daily life and quality of life of people living with dementia in a nursing home. A pretest–posttest follow-up study with The Vitality Garden intervention

Melanie van der Velde - van Buuringen, Hilde Verbeek, Wilco P. Achterberg, Monique A.A. Caljouw

The intervention

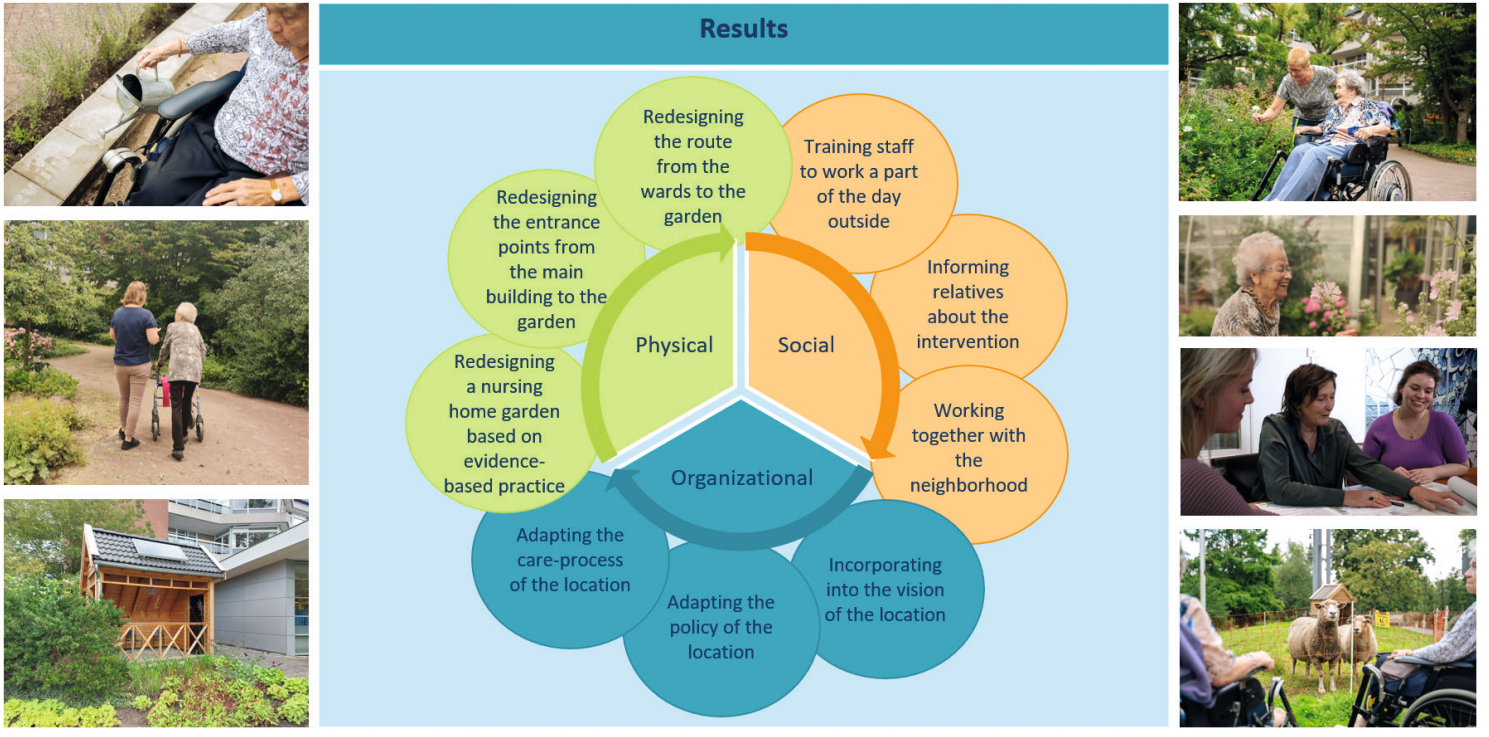

Figure 2. *The multicomponent garden use intervention incorporating physical, social and organizational environmental components, developed in co-creation with stakeholders.*

The implementation of the intervention, developed in co-creation with stakeholders

Physical environment (developed and executed 2022/2023)

1. Redesigning the nursing home garden, whereby the wishes and needs of residents, participants, (in)formal caregivers, and volunteers were integrated with recommendations from scientific research and experts, through a step-by-step procedure during the design process.
   - The Nursing Home Garden Checklist (NHGC):
     - Recommendations from scientific research and experts were collected with a literature review and by talking to local exper£ts (garden and landscape architect, elderly care physician, psychologist, occupational therapist, physical therapist).
     - This information was used to create the NHGC, a checklist with items regarding accessibility, safety, orientation, social interaction, meaningful activities, reminiscence, stimulating the senses, orientation to time and place, sustainability and assurance, and greenery. Also biodiversity, animal welfare, and sustainable solutions for climate change were important components.
   - A step-by-step design process:
     - Program of Requirements: The members of the project team work together to draw up a program of requirements. Who will be the user groups of the garden? Will people from outside the nursing home be able to use the garden? To what extent will the garden be freely accessible to the nursing home residents?
     - The Nursing Home Garden Checklist (NHGC): The NHGC is based on factors that affect the daily use of the garden. It is completed by at least 3 members of the project team, one of whom must be the garden and landscape architect. Elements on which members of the project team have provided different answers must be discussed. The results of the requirements program and the checklist are interpreted by the garden and landscape architect, who will then translate them into a first draft version of the garden improvement plan.
     - Survey: All project team members review and discuss version 1 of the draft garden improvement plan. They then decide which questions they want answered by the garden's user groups. These user groups may include clients, (in)formal caregivers, volunteers, and others. These questions can then, for example, be collected in a survey and distributed to all user groups. Another option is to conduct semi-structured interviews.
     - In-house expertise: The garden and landscape architect translates the survey results into version 2 of the draft garden improvement plan. This second version is discussed with representatives from various

disciplines within the organization, such as occupational therapists, physical therapists, and psychologists. Their expertise covers different aspects of garden use, for example, regarding safety and experience.
    - Definitive improvement plan: The garden and landscape architect translates the outcomes of the feedback from the various disciplines into version 3 of the draft garden improvement plan. This version is discussed with all members of the project team. The garden and landscape architect then translates the results of this final discussion into a definitive version of the garden improvement plan.
    - Evaluation: One year after the garden has been realized, the NHGC is completed again by at least 3 members of the project team, which must include the garden and landscape architect. The results are compared with the previous year. Any action points are assigned.
2. Redesigning the entrance points from the main building to the garden. Due to restrictions in financing, only one of the 4 entrances could be modified.
    - Creating an extra entrance point closer to the wards:
        - A project team consisting of the organization's housing manager and an architect led the design process and execution of the extra entrance point. Recommendations of experts were collected by talking to local experts (garden and landscape architect, elderly care physician, psychologist, occupational therapist, physical therapist).
        - Recommendations included using doors that open automatically, provide a draught lock, making the doors recognizable as doors with a clear color contrast with the surroundings, and create a hall at the entrance to the garden as at home (sitting area, coat rack with coats, shoe rack, blankets). Also an extra toilet close to the entrance was constructed.
3. Redesigning the route from the wards to the garden. Due to restrictions in financing, only two of the many routes to the entrances could be modified.
    - Redesigning the interior of the hallway from the ward to the new entrance point to the garden:
        - A project team consisting of the location manager, team managers/ welfare managers, and the organization's interior design experts led the design process.
        - The design included the use of a landmark, contrasting colors, familiar and recognizable elements, and signage.

Social environment (developed and executed 2023-present)

1. Guide staff to work a part of the day outside
    - The elderly care physician and psychologist of the wards held team meetings with the caregivers about opening the doors, concerns regarding safety, and practical implications.

- Team managers and nurses regularly discussed perceived barriers with their teams, and tried to find solutions to these thresholds to go outside with the residents.
- The location stimulated all staff to work part of the day outside using communication strategies (e.g. using posters, special events)

2. Informing relatives about the intervention
   - During information evenings relatives of all residents were informed about the intervention, and the Vitality Garden study. They also got to experience the urgency of the problem, by using stimulation of the senses to recall meaningful memories while being outside in nature.

3. Working together with the neighborhood
   - Collaborations were started with a petting zoo (using their expertise about animal welfare and goats that could stay at the BLH part of the year)

Organizational environment (developed and executed 2023-present):

1. Incorporating the intervention into the vision of the BLH
   - A new slogan was created (from inside to outside) which was communicated by e.g. posters.
2. Adapting the policy of the BLH
   - A new function was created (BUITENmens)
3. Adapting the care-process of the BLH
   - A flyer was made that was included in the intake dossier that was given to new residents and their relatives.
   - Per resident, the elderly care physician, psychologist, caregiver, and legal representative of the resident made a risk-inventory regarding opening the doors and give the resident the opportunity to go outside freely during the day. Appropriate measures were taken when necessary, like for example using care technologies.
   - The opportunity to go outside freely was discussed during multidisciplinary meetings about the residents.

6

A toolkit for designing a nursing home garden for people living with advanced dementia

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Submitted

ABSTRACT

Objective: This article aims to describe the process of developing a toolkit to support the design of a nursing home garden intended for independent garden use by people living with advanced dementia.

Background: For people living with dementia in nursing homes, the nursing home garden is an important means of getting outside. The development of the toolkit was part of the larger 'the Vitality Garden' study, which aimed to understand the effects of garden use and its implementation on the daily lives of people living with dementia in nursing homes. A co-creation approach was used to develop a toolkit for designing a nursing home garden.

Methods: The process of designing a nursing home garden was approached using a framework that included: a) creating an evidence-based practice checklist for garden design; b) co-designing with the garden user groups (people living with dementia, (in)formal caregivers, volunteers); and c) using an iterative, empathetic design process. This framework was used to guide decision-making in daily practice during the execution of the design and landscaping of a nursing home garden.

Results: The toolkit was developed using insights from daily practice and lessons learned during the garden's design and landscaping. The toolkit consists of a) an introduction, b) the foundations, c) the design process of the garden, d) a roadmap, e) *The Nursing Home Garden Checklist* (NHGC), and f) a reference list.

Conclusions: The nursing home garden design toolkit is intended as a resource to guide care organizations in creating designs for existing or new nursing home gardens that are suitable for independent use by people living with advanced dementia.

INTRODUCTION

It is estimated that more than 55 million people worldwide are living with dementia, with numbers doubling every 20 years, reaching 78 million by 2030 and 139 million by 2050.[1, 2] In the Netherlands, approximately 300,000 people are living with dementia, 80,000 of whom reside in long-term care facilities (LTCF).[3] Dementia is a syndrome caused by several diseases that lead to progressive deterioration in cognitive function.[1] Performing daily activities, such as going outside at will, becomes increasingly challenging, especially for people living with dementia in nursing homes.[1] The Dutch Care and Coercion Act, which is also based on the Dutch Constitution and the European Convention on Human Rights (ECHR), states that the right to go outside is a fundamental human right.[4] In addition, the possibility of going outside into a natural green environment is a basic human need, offering a sense of freedom and a variety of sensory experiences.[5-8] For people living with dementia in nursing homes, the nursing home garden is an important means of getting outside.

An increasing number of studies have focused on the effects of garden use on the quality of life (QoL) and behavioral and psychological symptoms of dementia (BPSD) of people living with dementia in nursing homes. Overall, preliminary results suggest positive effects of garden use on QoL, BPSD, and other outcomes such as stress, sleep, and mood, as well as physical and cognitive functioning. [9, 10] Despite these well-known benefits, however, being outside is still not a regular part of daily nursing home practice.[5, 6, 11] Most people living with dementia in nursing homes spend their days being inactive, either lying down or sitting, and on average, more than 90% of the residents stay inside and on their wards during the day. [12] In addition to availability of staff, resident safety, concerns about the weather and seasons, the design of the main building, and social activities, the design of the outside environment can also be an enabler or a barrier to going outside. More specifically, the design of the garden can stimulate garden use by people living with dementia in nursing homes.[13]

To support the design of a nursing home garden for independent garden use by people living with advanced dementia, a toolkit was developed as part of a larger study called ‘the Vitality Garden’. The Vitality Garden study aims to understand the effects of garden use and its implementation on the daily lives of people living with dementia in nursing homes. One of the study’s components was the design of a nursing home garden based on scientific literature and evidence-based practice. The toolkit aims to guide care organizations through the process of designing an evidence-based nursing home garden that addresses the challenges of designing a garden suitable for people living with advanced dementia. This paper describes the development process of this toolkit.

METHODS

The toolkit was developed through a mutual collaboration with the nursing home organization Pieter van Foreest, the University Network for the Care Sector South Holland (UNC-ZH), the Living Lab in Ageing and Long-Term Care (AWO Limburg) [14], and a garden and landscape architect (EBvdW). The setting was an existing garden of a large nursing home (B), located in the western part of the Netherlands. B has nine psychogeriatric wards (142 residents), three somatic wards (82 residents) and two screening wards (31 residents).

Toolkit development

Toolkit development took place in three steps, each grounded in specific theoretical frameworks and supported by relevant literature. Step 1, the literature search, ensured that the process of designing a nursing home garden was based on a solid foundation of empirical evidence.[15] In Step 2, the framework for the process of designing a nursing home garden used a co-creation approach to ensure that the needs and preferences of all stakeholders were considered, thereby enhancing the relevance and effectiveness of the garden design.[16] Step 3 involved using information about effective knowledge translation strategies to develop the toolkit, with the aim of improving the use of evidence-based research to improve care in nursing homes. [17, 18]

Step 1: Literature search

Based on scientific and professional literature, as well as the expertise of the researchers, the first outlines of a framework for the process of designing a nursing home garden were developed (see **Appendix A** for the references used). This outline included the following components: a) creating an evidence-based practice checklist for garden design; b) co-designing with the garden user groups (people living with dementia, (in)formal caregivers, volunteers); and c) using an iterative, empathetic design process. These components are explored further in Step 2 of the toolkit development.

Step 2: Framework of the process of designing a nursing home garden

The outlines of this framework were used to guide decision-making in daily practice during the execution of the design and landscaping of the nursing home garden.

Step 2a: Creating an evidence-based practice garden design checklist

Based on the same scientific and professional literature as mentioned in Step 1 'Literature search', and the expertise of various practitioners (garden and landscape architect, occupational therapist, physical therapist, psychologist), EBvdW created *The Nursing Home Garden Checklist* (NHGC) (see **Appendix A** for the references used). The NHGC consists of ten domains, each starting with a

short description and followed by topics that can be used to check whether they are sufficiently present or need improvement. The checklist can be completed online and is therefore more user-friendly. The domains are: accessibility, safety, orientation, social interaction, meaningful activities, reminiscence, stimulating the senses, orientation to time and place, sustainability and assurance, and greenery (see **Table 1**).

Table 1. *The ten domains of the Nursing Home Garden Checklist (NHGC)*

Domain	Topics
Accessibility	Physical and cognitive accessibility of the garden (n=19)
Safety	Predetermined level of safety of the garden (n=38)
Orientation	The extent to which the resident understands how to access the garden, which routes can be taken in the garden and how to leave the garden and re-enter the nursing home building (n=16)
Social interaction	The opportunity to meet other residents, family, friends, and caregivers, bearing in mind that part of the garden remains a quiet place without 'forced' social interaction (n=16)
Meaningful activities	Providing space for a variety of activities (n=12)
Reminiscence	The possibility to experience stimuli that remind one of past pleasant memories (n=2)
Stimulating the senses	Providing multisensory stimuli (n=12)
Orientation to time and place	Elements in the garden contributing to sense what time and type of season it is (n=7)
Sustainability and assurance	Sustainability regarding adapting to necessary changes, the city's ecosystem and nature (n=6)
Greenery	The importance of plant knowledge (n=5)

Step 2b: Co-designing with the garden user groups

Crucial requirements of the garden, like '*Who will be the user groups of the garden?', 'Will people from outside the nursing home be able to use the garden?'*, and '*To what extent will the garden be freely accessible for nursing home residents with dementia?'*, were discussed with location, care, wellbeing, and housing managers. Also, recommendations were collected from professional experts such as the garden and landscape architect, elderly care physician, psychologist, occupational therapist, and physical therapist.

One example of these recommendations was a solution for a design problem regarding a dead-end path with a view on an easy to open fence to another path that residents were not permitted to access independently. This was near the new kitchen garden and very near the entrance to the garden. During an interdisciplinary brainstorming session with the psychologist, occupational therapist, and physical therapist, a joint solution was created, whereby the dead end was given a purpose

by installing a water tap and providing watering cans. This object and some extra plants blocked the view to the fence. Another example is to strategically place parts of fences near potentially dangerous areas, such as stairs. By placing these pieces of fence, the stairs stayed accessible, while guiding walking routes past them. In this way, one had to walk to the stairs purposefully and the risk of accidentally falling down the stairs was minimized. The stairs themselves were fitted with railings on both sides, which could be used for physical therapy, thus giving them an additional purpose.

In addition to co-designing with professional experts, a survey was used to collect the wishes and preferences of the garden user groups, including people living with dementia, (in)formal caregivers and volunteers (see **Appendix B** for the survey used). The survey was actively distributed, both digitally and in paper form. The (in)formal caregivers helped the residents complete the survey when necessary. One outcome of the survey was information about elements of the garden that the users wanted to keep, such as the lush green vegetation. Another example is the desire for more small seating areas, spread throughout the garden, to have more privacy during visits.

Step 2c: Using an iterative, empathetic design process
Every garden and landscape architect is able to use an iterative design process, but not every architect is skilled in empathetic design. Empathetic design involves taking the different interests of the co-designers and user groups into account, with the aim of contributing to the QoL of the user groups through garden design. [19] The garden design was created using an iterative step-by-step procedure, with each step integrating information from different sources and processing feedback (see **Figure 1**). First a program of requirements was drawn up. Then the NHGC was created and filled in. EBvdW then interpreted the results of the requirements program and the checklist, and translated that information into a first draft of the garden improvement plan (the design). Following a discussion about the design by the managers and researcher, the survey described in Step 2b was created, distributed, and the results were collected. EBvdW then translated the survey results into a second draft of the garden improvement plan. This second version was discussed with representatives from various disciplines within the organization, including occupational therapists, physical therapists, and psychologists. Their expertise covers different aspects of garden use, such as safety and experience. EBvdW then translated the outcomes of the feedback from the various practitioners into a third draft of the garden improvement plan. This version was discussed with the managers and researcher, resulting in a definitive version of the garden improvement plan.

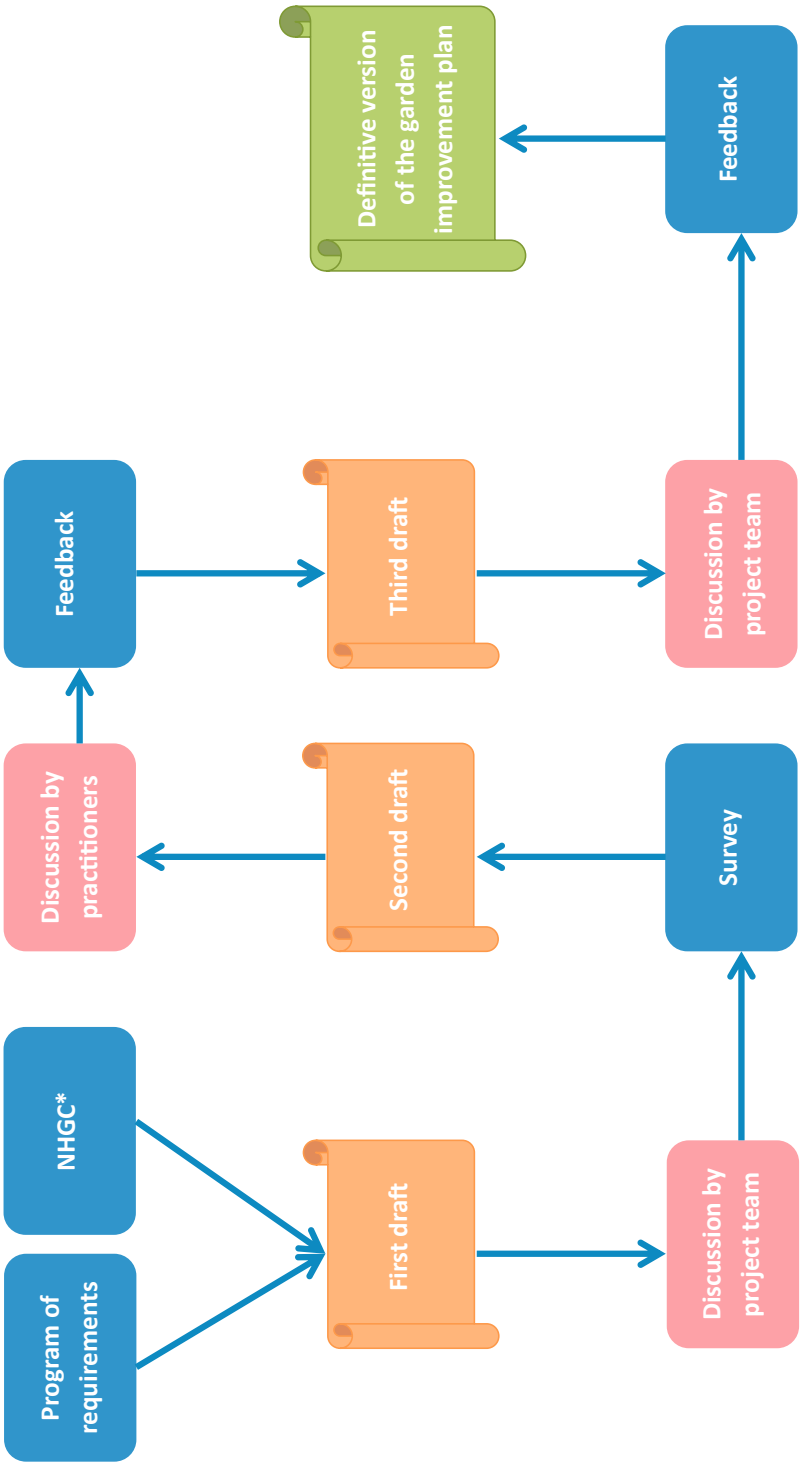

Figure 1. *Process of the iterative, empathetic design procedure. NHGC* = The Nursing Home Garden Checklist*

Step 3: Development of the toolkit for designing a nursing home garden
The toolkit was developed using insights from daily practice, lessons learned during the design and landscaping of the garden, and the results of Steps 1 and 2. The toolkit consists of a) an introduction with general and background information about the topic, context and development of a nursing home garden for people living with dementia; b) the foundations providing information about stakeholders and preconditions for using the toolkit; c) the design process of the garden, consisting of six steps (formulating a program of requirements, filling in the NHGC, putting out a survey, using in-house expertise of practitioners, delivering the definitive improvement plan, and executing an evaluation); d) a roadmap providing a concrete action plan according to this design process; e) the NHGC; and f) a reference list of the scientific literature and professional literature used (see **Appendix A**). The complete toolkit is available to access online (see also **Appendix C** for the complete toolkit).[20]

DISCUSSION

The toolkit that we developed through this iterative, empathetic and evidence-based process can serve as a valuable resource to guide designing a nursing home garden for use by people living with dementia, (in)formal caregivers, and volunteers, based on evidence-based practice.

The information provided in this toolkit can increase the likelihood that the design process is executed thoroughly and that the nursing home garden meets the needs, wishes and preferences of the garden user groups, particularly those living with dementia. It highlights the importance of integrating information from different sources and using a stepwise design process.

Using this evidence-based design toolkit can also be the first step in implementing the use of the garden and may contribute to garden use as a regular part of daily nursing home practice. This can involve promoting the adaptability of the garden and preparing residents, (in)formal caregivers and volunteers to be active users of the garden by involving them in the design process. By operationalizing implementation strategies, a start can be made with identifying barriers and enablers to garden use.[21] In addition, the acceptability, appropriateness, and feasibility of the intervention can be improved.[22, 23]

One strength of this toolkit is the use of a co-creation approach during the development process. This approach involves researchers, garden user groups, and professionals collaborating from the beginning. It is an iterative and creative process in which ideas are jointly developed and refined, ensuring the toolkit is relevant, user-friendly, and effective.[16]

The integration of empathetic design further strengthens this design process. While iterative design is commonly used by garden and landscape architects, empathetic design requires a deeper sensitivity. It means designing the garden with the explicit aim of improving the quality of life of its users by actively considering their diverse needs and wishes.[19] Through this combined approach, the scientific results of the larger study were translated into a practical toolkit that fits within the context of its users.

On the other hand, this approach limits the generalizability of the toolkit. It was developed in the Netherlands. Variations in policy, cultural contexts, and climate may affect the applicability of this resource in different countries. However, the toolkit is a living document, and feedback is greatly appreciated. Over the next few years the authors will process the feedback to make the toolkit more generalizable.

CONCLUSIONS

The evidence-based nursing home garden toolkit is a resource intended to guide care organizations in making designs for existing or new nursing home gardens that are suitable for independent use by people living with advanced dementia.

Additional files

The full toolkit can be accessed from the website https://unc-zh.nl/wp-content/uploads/2024/05/Toolkit%E2%80%93De-Vitale-Tuin-UK-fillable.pdf.

Authors' contributions

All authors were involved in the design of the study and toolkit development, as well as manuscript preparation and review. All authors read and approved the final manuscript.

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REFERENCES

1. World Health Organization, *Fact-sheet Dementia*. 2023 15-03-2023 [cited 2024 04-04-2024]; Available from: https://www.who.int/news-room/fact-sheets/detail/dementia.
2. Alzheimer's Disease International, *https://www.alzint.org/about/dementia-facts-figures/dementia-statistics/.*
3. Alzheimer Nederland, *Factsheet cijfers en feiten over dementie*. 2021.
4. Ministry of Health, Welfare and Sport, *Wet zorg en dwang psychogeriatrische en verstandelijk gehandicapte cliënten (Care and Coercion Act)*. 2020.
5. Liljegren, M., et al., *Introducing the Outdoor Environment as an Arena for Person-Centered Care and Rehabilitation at Residential Care Facilities for Older Adults—A Care Worker's Perspective.* Journal of Aging and Environment: p. 1-17.
6. Nordin, S., et al., *Outdoor stays-A basic human need except for older adults in residential care facilities? Researcher-practitioner interaction crosses zones and shows the way out.* Front Dement, 2024. 3: p. 1470691.
7. Evans, S.C., et al., *Connections with nature for people living with dementia.* Working with Older People, 2019. 23(3): p. 142-151.
8. Hendriks, I.H., et al., *Nature and dementia: development of a person-centered approach.* International Psychogeriatrics, 2016. 28(9): p. 1455-1470.
9. Velde-van Buuringen, M.v.d., et al., *The effect of garden use on quality of life and behavioral and psychological symptoms of dementia in people living with dementia in nursing homes: a systematic review.* Frontiers in Psychiatry, 2023. 14.
10. Nicholas, S.O., A.T. Giang, and P.L.K. Yap, *The Effectiveness of Horticultural Therapy on Older Adults: A Systematic Review.* Journal of the American Medical Directors Association, 2019. 20(10): p. 1351. e1-1351.e11.
11. Velde-van Buuringen, M.v.d., et al., *Which Characteristics are Associated With Going Outside for People Living With Dementia in Nursing Homes? A Cross-Sectional Study.* Journal of Applied Gerontology, 2024: p. 07334648241298107.
12. den Ouden, M., et al., *Daily (In)Activities of Nursing Home Residents in Their Wards: An Observation Study.* J Am Med Dir Assoc, 2015. 16(11): p. 963-8.
13. van den Berg, M.E.L., et al., *Understanding the Barriers and Enablers to Using Outdoor Spaces in Nursing Homes: A Systematic Review.* Gerontologist, 2020. 60(4): p. E254-E269.
14. Verbeek, H., et al., *The Living Lab In Ageing and Long-Term Care: A Sustainable Model for Translational Research Improving Quality of Life, Quality of Care and Quality of Work.* J Nutr Health Aging, 2020. 24(1): p. 43-47.
15. Charras, K., et al., *Designing gardens for people with dementia: literature review and evidence-based design conceptual frame.* Geriatr Psychol Neuropsychiatr Vieil, 2017. 15(4): p. 417-424.
16. Greenhalgh, T., et al., *Achieving Research Impact Through Co-creation in Community-Based Health Services: Literature Review and Case Study.* Milbank Q, 2016. 94(2): p. 392-429.
17. Grimshaw, J.M., et al., *Knowledge translation of research findings.* Implementation Science, 2012. 7(1): p. 50.
18. Graverholt, B., et al., *The effectiveness of a knowledge translation intervention on the implementation of NEWS2 in nursing homes, a pragmatic cluster RCT.* Implementation Science, 2024. 19(1): p. 64.
19. Beekhuis - van der Weijde, E., *Het vormgeven van een buitenruimte in de zorg.* 2018 [cited 2025 20-01-2025]; Available from: https://www.bureau-weijde.nl/wp-content/uploads/2025/01/scriptie-Het-vormgeven-van-een-buitenruimte-in-de-zorg.pdf.

20. The University Network for the Care sector South Holland, *De Vitale Tuin*. 2024 24-06-2024]; Available from: https://unc-zh.nl/wp-content/uploads/2024/05/Toolkit%E2%80%93De-Vitale-Tuin-UK-fillable.pdf.

21. Powell, B.J., et al., *A refined compilation of implementation strategies: results from the Expert Recommendations for Implementing Change (ERIC) project.* Implementation Science, 2015. 10(1): p. 21.

22. Damschroder, L.J., et al., *The updated Consolidated Framework for Implementation Research based on user feedback.* Implement Sci, 2022. 17(1): p. 75.

23. Proctor, E., et al., *Outcomes for Implementation Research: Conceptual Distinctions, Measurement Challenges, and Research Agenda.* Administration and Policy in Mental Health and Mental Health Services Research, 2011. 38(2): p. 65-76.

APPENDIX A: REFERENCES USED IN TOOLKIT

van der Velde-van Buuringen M, Beekhuis van der Weijde E, Verbeek H, Achterberg WP, Caljouw MAA. *A toolkit for designing a nursing home garden for people living with advanced dementia*

REFERENCES TOOLKIT

1. Algemene dagelijkse levensverrichtingen. (z.d.). In Wikipedia. Accessed on 9 juli 2018, Available from https://nl.wikipedia.org/wiki/Algemene_dagelijkse_levensverrichtingen
2. Andrews, J.(2013) Improving the design of housing to assist people with dementia University of Stirling, The Dementia Services Development Centre.
3. Andela, G. & Guinée, A. (2006) Vanzelfsprekende schoonheid. Tuin- en landschapsarchitect Hans Warnau. Wageningen: uitgeverij Blauwdruk.
4. Becker, H.M., (2003) Levenskunst op leeftijd, geluk bevorderende zorg in een vergrijzende wereld. Delft, Eburon.
5. Berg, A. van den & Berg, M. van den,(2001) Van buiten word je beter. Een essay over de relatie tussen natuur en gezondheid, Wageningen, Alterra.
6. Berg, A.E. van den (2015). Groen in de zorg: Een quick-scan inventarisatie van het groene zorgaanbod in Nederland. Groenekan: Natuur voormensen omgevingspsychologisch onderzoek.
7. van den Berg, E.A., and van Winsum - Westra. M., Ontwerpen met groen voor gezondheid; richtlijnen voor de toepassing van groen in "healing environments", in Reeks belevingsonderzoek. 2006: Wageningen. p. 64.
8. Bovenberg, F., Takkenkamp, J., Vennik, L. & Francken, G. (2010) Helende omgeving draagt bij aan herstel. Sociale Psychiatrie (2010,94) p 7-14.
9. Bourdon, E., Belmin, J. (2021) Enriched gardens improve cognition and independence of nursing home residents with dementia: a pilot controlled trial. Alz Res Therapy 13, 116 (2021). https://doi.org/10.1186/s13195-021-00849-w
10. Browning, W.D., Ryan, C.O. & Clancy, J.O. (2014). 14 Patterns of Biophilic Design. New York: Terrapin Bright Green llc.
11. Chalfont, G., Walker, A., (2013). Dementia Green Care Handbook of Therapeutic Design and Practice. Safehouse books, Lancashire.
12. Clement, A.J.M. (2014) Samen langer zorgeloos! Eindhoven:TU.
13. Cohen-mansfield, J. (2007) Outdoor Wandering Parks for Persons with Dementia, Journal of Housing for the Elderly.
14. Cooper Marcus, C. (2007) Alzheimer's Garden Audit Tool, Journal of Housing for the Elderly.
15. Cullen, G. (1971) The concise Townscape, The Architectural Press, Oxon, New York.
16. Detweiler, M. B., et al. (2002). Wander Gardens: Expanding the Dementia Treatment Environment
17. Deenik, J. (2018, 26 mei). Improving health, step by step: physical activity for severe mental illness in the Netherlands. Accessed on 23 juli 2018, Available from https://blogs.bmj.com/ bjsm/18/05/26/improving-health-stepby-step-physical-activity-for-severe-mental-illness-in-the-netherlands/
18. Evans, S.C., et al., Connections with nature for people living with dementia. Working with Older People, 2019. 23(3): p. 142-151.
19. Fleming, R., Bennett, K., (2017). Dementia training Australia Environmental design resources, University of Wollongong.

20. Geeter, K. de & Munsterman, k. (2017). LACCS-programma. Accessed on 20 juli 2018, Available from http://www.laccsprogramma.nl/36-inhoud/139-laccs-waarden

21. Gezondheidsraad & RMNO, (2004) Natuur en gezondheid. Invloed van natuur op sociaal, psychisch en lichamelijk welbevinden. Den Haag: GR, publicatie nr 2004/09; RMNO, publicatie nr A02a

22. Gezondheidsraad, (2017) Gezond groen in en om de stad. Den Haag: GR, publicatie nr 2017/05

23. Giebel, C., de Boer, B., Gabbay, M., Watkins, C., Wilson, N., Tetlow, H., & Verbeek, H. (2022). Developing a Meaningful Garden Space in a Care Home with Staff and Family Members: A Qualitative Study. International journal of environmental research and public health, 19(12), 7025. https://doi.org/10.3390/ijerph19127025

24. Graham-Cochrane, T. (2010). Gardens that care: Planning outdoor environments for people with dementia. Alzheimer's Australia SA. http://www.enablingenvir onments.com.au/uploads/5/0/4/5/50459523/gardens_that_care.planning_outdoor_environments_ for_people_with_dementia.pdf

25. Grant, C.F. & Wineman DArch. J.D., (2007) The Garden-Use Model, Journal of Housing for the Elderly

26. Haas, G.J.F. de, (2011) Leren met een beperking; ABC. Theorie en toepassing.

27. Haas, G.J.F. de (2017, 12 december). Gert-Jan de Haas over het brein en complex gedrag op CCE Podium. Accessed on 10 juni 2018, Available from https://www.cce.nl/over-cce/ actueel/gert-jan-de-haas-over-het-brein-encomplex-gedrag-op-cce-podium

28. Hamel, R.,(2009) Ontwerpen voor de gebruiker, het nut van omgevingspsychologische expertise in het ontwerpproces, artikel in topos/02/2009UVA

29. Haug, J.J.M. &.Schuurman, F. (2017)Voetpaden voor iedereen. Bouw Advies Toegankelijkheid, Utrecht.

30. Hendriks, I.H., et al., Nature and dementia: development of a personcentered approach. International Psychogeriatrics, 2016. 28(9): p. 1455-1470.

31. Huber, M.,Vliet, M. van & Boers, I. (2016) Heroverweeg uw opvatting van het begrip 'gezondheid' NED TIJDSCHR GENEESKUNDE (2016;160, 1-5). Intramurale zorg.(z.d.). In Wikipedia. Geraadpleegd op 10 juni 2018, van https://nl.wikipedia.org/wiki/Intramurale_zorg.

32. Jansen, S.J. (2009),Technologie in de verstandelijk gehandicaptenzorg. Onderzoek naar het arbeidsbesparende vermogen van toezichthoudende technologie in de nachtzorg. scriptie Master Health Care Management /Health Sciences, Universiteit Twente, Enschede.

33. Karmanov, D.(2009) Feeling the Landscape Six Psychological Studies into Landscape experience, PhD thesis Wageningen

34. Lemaire, T. (1970). Filosofie van het landschap. Baarn:Uitgeverij Ambo b.v.

35. Lynch K. (1972) What time is this place,Massachusset, MIT Press.

36. Mul, F. (2018,10 juli). Verplichting buitenruimte bij wonen met zorg komt terug. Accessed on 16 juli 2018, Available from https://www.vgn.nl/artikel/26811

37. Motealleh, P., Moyle, W., Jones, C., Dupre, K. (2021)The Impact of a Dementia-Friendly Garden Design on People With Dementia in a Residential Aged Care Facility: A Case Study, Health Environments Research & Design Journal 2022, Vol. 15(2) 196-218 2021.

38. NHS (2018). What is dementia? Accessed on 16 juli 2018, Available from https://www.nhs.uk/conditions/dementia/about/

39. Nicholas, S.O., A.T. Giang, and P.L.K. Yap, The Effectiveness of Horticultural Therapy on Older Adults: A Systematic Review. Journal of the American Medical Directors Association, 2019. 20(10): p. 1351. e1-1351.e11.

40. Nillisen, J. & Opitz, S. (2013). Dimensie voor dementie. Kleinschalige woonvormen voor dementerende ouderen. Arnhem: Wiegerinck.

41. NVTL (2010) Gezond Ontwerp! De betekenis van tuin en landschapsarchitectuur in de zorg. Amsterdam, NVTL.

42. Oldenburger-Ebbers, C.S.,Backer, A.M. & Blok, E., (1995). Gids voor de Nederlandse Tuin- en landschapsarchitectuur. Rotterdam: Uitgeverij De Hef publishers.

43. den Ouden, M., et al., Daily (In)Activities of Nursing Home Residents in Their Wards: An Observation Study. J Am Med Dir Assoc, 2015. 16(11): p.963-8.

44. Paus Franciscus (2015, 24 mei). Laudato si' - 'Wees geprezen' - over de zorg voor het gemeenschappelijke huis (p.150). Accessed on 21 juli 2018, Available from https://www.rkdocumenten.nl/rkdocs/

45. Plaats, A. van der (2017, 7 juni). Ontstaansgeschiedenis. Accessed on 01 juli 2018, Available from http://breincollectief.nl/

46. Pollock, A.& Marshal, M.,(2012) Designing outdoor spaces for people with dementia., University of Stirling, The Dementia Services Development Centre.

47. Pollock, A. with Cunningham, C., (2018) The room outside., HammondCare Media, Edinburgh, Scotland.

48. Roncken, P.A., (2018) Shades of sublime a design for landscape experiences as an instrument in the making of meaning. Wageningen: Wageningen University.

49. Staats, H. (2002). Omgevingspsychologie in de ruimtelijke ordening. Welbevinden als functie van drie ruimtelijk bepaalde criteria. Leiden: Werkgroep Energie- en Milieuonderzoek. Universiteit Leiden (extern rapport, 34 pg.).

50. Steenhuis, M & Hooimeijer,S.,(1992) Maakbaar landschap Nederlandse Landschapsarchitectuur 1945-1970, Rotterdam, NAI uitgevers

51. Stichting Voorall, (2016) Richtlijnen 'Paden in parken en natuurgebieden'. Den Haag

52. Stigsdotter,U.& Grahn, P. (2009) What Makes a Garden a Healing Garden? Journal of Therapeutic Horticulture (2009 XIX), p 60-69.

53. Stuart Smith, S., (2020) The well gardened mind. Rediscovering nature in the modern world. London, William Collins / Harper Collins Publishers.

54. Tavenier, M. (2012, 20 november) Revalidatietuin centrum voor reuma en revalidatie Rotterdam (CRRR) Accessed on 28 juli 2018, Available from http://marnixtavenier.nl/2012/11/revalidatietuin-hillegersberg/

55. Timmers-Huigens, D. (1995) Mogelijkheden voor verstandelijk gehandicapten. STAD:Lemma., samenvatting p.42-45

56. van der Velde-van Buuringen, M., W.P. Achterberg, and M.A.A. Caljouw, Daily garden use and quality of life in persons with advanced dementia living in a nursing home: A feasibility study. Nurs Open, 2020.

57. van der Velde-van Buuringen, M., R. Hendriks-van der Sar, W.P. Achterberg, and M.A.A. Caljouw, The effect of garden use on quality of life and behavioral and psychological symptoms of dementia in people living with dementia in nursing homes: a systematic review. Frontiers in Psychiatry, 2023. 14.

58. Vereniging Gehandicaptenzorg Nederland (2017). Feiten en cijfers. Accessed on 16 juli 2018, Available from https://www.vgn.nl/feitenencijfers.

59. Vlug (2013). Het ontwerp voorop Landschapsarchitectuur in een nieuwe tijd. In J. Vlug, A. Noortman, R. Aben, B. ter Mull & M. Hendriks(red.).De noodzaak van ontwerpen. Veldverkenningen in de Nederlandse landschapsarchitectuur, (p 8-15). Velp: Hogeschool Van hall Larenstein.

60. Vroom, M.J., (1967) Het Landschap onze tuin

61. Vuksanovic, B., Castelijns, M. & Bavel, M. van. (2013) IMPACT – Samen ontwerpen aan betere gebouwen voor de geestelijke gezondheidszorg.

62. Van Aken architecten BNA Onderzoek. https://www.bna.nl/bnaonderzoek/kennisbibliotheek/

63. Wouwe, H.van & Weerd, D. van de (2001).Triple-C Herstel van het gewone leven. Accessed on 9 juli 2018, Available from http://www.methodieken.nl/methodieken_ methoden.asp?methode_Triple-C-Herstel-van-het-gewoneleven

64. Zeisel, J. (2006) Inquiry by Design Environment, Behavior, Neuroscience in Architecture, Interiors, Landscape and Planning. New York - London: W.W. Norton & Company

65. Zeisel, J. (-) Dr. John Zeisel. Accessed on 1 juli 2018, Available from https://www.imstillhere.org/About/dr-john-zeisel

66. Zevenbergen, H. (2012, 14 augustus). De lichaamsgebonden ervaringsordening. Accessed on 26 juli 2018, Available from http://www.platformemg.nl/publicatie/ de-lichaamsgebonden-ervaringsordening/

APPENDIX B: SURVEY VITALITY GARDEN

van der Velde-van Buuringen M, Beekhuis van der Weijde E, Verbeek H, Achterberg WP, Caljouw MAA. *A toolkit for designing a nursing home garden for people living with advanced dementia*

Survey for the Vitality Garden
Being outside is inseparably linked to positive memories in our lives, and this remains just as important when people live in a nursing home. In order to make going outside possible for more residents at our nursing home, we are going to redesign the garden. To do this, we need help from relatives, volunteers, but also clients and colleagues. By completing this survey we get a good picture of your wishes. Of course it is impossible to incorporate all feedback into the garden, but by completing this survey we can take it into account. We greatly appreciate all feedback. Are there things we can do better? Let us know.

Explanation of the survey
For each question, circle the answer that applies to you. Some questions apply to specific target groups, this is described within the question. If the question does not apply to you, skip it. The survey consists of a total of eleven questions. First there are eight multiple choice questions, after which there are three open questions. Completing the survey takes about five minutes and all results will be processed anonymously and will only be used for designing the garden.

Question 1
In what way are you involved with our nursing home?

A. Resident/client
B. Family/friend
C. Volunteer
D. Caregiver
E. Practitioner
F. Facility worker
G. Welfare manager
H. Location/Team Manager

Question 2
How often do you use the garden?

A. Every day
B. Every week
C. Sometimes
D. Never

Question 2b - This question only applies to residents or clients
Can you go outside independently?

A. Yes, I can go outside independently and use the garden
B. Yes, I can go outside independently, but with aids
C. No, I can only go outside with others
D. No, I cannot go outside

Question 2c - This question only applies to family/friends or caregivers.
Can residents/clients go outside independently?

A. Yes, the resident/client I am involved with can go outside independently
B. Yes, the resident/client I am involved with can go outside independently, but with aids
C. No, the resident/client I am involved with can only go outside with others
D. No, the resident/client cannot go outside

Question 3
Would you like to go outside more often?

A. Yes
B. No
C. Maybe

Question 4
Which statement fits best?

A. If I want to go outside, it is easy
B. If I want to go outside, I have to look for the entrance points to the garden, or ask for directions
C. If I want to go outside, I don't know where the entrance points to the garden are

Question 5
Which statement fits best?

A. I can easily go outside
B. I can go outside, but it is a long walk for me to the entrance points to the garden
C. I need help to go outside, the garden is too far away

Question 6a
Which statement fits best?

A. A The garden feels pleasant and safe
B. The garden does not feel safe

Question 6b
What problems do you experience when you want to go outside?

A. I don't experience any problems
B. The tiles are uneven and that creates a risk of falling
C. The garden is too confusing and that makes it easy to get lost
D. There is not enough space to hide when cold and wet outside

Question 7
What do you like to do most in the garden? (multiple answers possible)

A. Sitting and enjoying the flowers and birds
B. Taking a walk
C. Picking flowers for indoors
D. Drinking coffee / having lunch
E. Listening to (live) music
F. Having a conversation
G. Giving therapy / receiving therapy outside
H. Doing administrative work

Question 8
What would you most like to do in the garden after the redesign?

A. Doing gardenwork (watering plants, raking leaves, vegetable garden)
B. Watch animals (think of rabbits, sheep and/or chickens)
C. Drinking coffee / having lunch
D. Go to a playground with (grand)children
E. Listening to (live) music
F. Creative activities
G. Taking a walk
H. Doing administrative work (private place with power outlet)

Question 9
What do you like most about the garden as it is now? I am happy with...

Question 10
Do you have a multiple choice question that you would like to explain further?

Question 11
Do you have any tips regarding the garden and its use?

APPENDIX C: TOOLKIT

van der Velde-van Buuringen M, Beekhuis van der Weijde E, Verbeek H, Achterberg WP, Caljouw MAA. *A toolkit for designing a nursing home garden for people living with advanced dementia*

How to design a nursing home garden?

An evidence-based practice toolkit

VITALE TUIN

Colophon

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Introduction

This toolkit was developed for organizations that want to create a garden based on evidence-based practice specifically for nursing homes.

In recent years, there has been an increase in the number of studies focusing on the effects of being outdoors on people living with dementia in nursing homes. Overall, preliminary results suggest positive effects of garden use on quality of life, behavioral and psychological symptoms of dementia, and other outcomes related to quality of life or behavioral and psychological symptoms (stress, sleep, mood), as well as physical and cognitive functioning. Qualitative studies that examined the benefits, barriers, personalization, and impact of garden use on quality of life have uncovered themes related to the experiences and possible mechanisms of the positive effects of being outdoors from the perspectives of people living with dementia, nursing home staff, and family members. Garden use appears to have a positive impact on quality of life by promoting a sense of freedom, social interaction, a calming effect, memories, and enjoyment.

Despite these benefits, it seems that being outside is still not a regular part of daily nursing home practice. Most people living with dementia in nursing homes spend their days being inactive, lying down or sitting, and on average more than 90% of residents stay on their wards during the day.

In addition to staffing, resident safety, weather and seasons, design of the main building and social activities, the design (process) can also be an enabler or a barrier to garden use in nursing homes. This toolkit aims to guide organizations through the process of (re)designing an existing or new garden into a nursing home garden based on evidence-based practice.

It was developed as part of the doctoral research of Melanie van der Velde-van Buuringen, in partnership with Pieter van Foreest, the academic networks for elderly care University Network for the Care Sector South Holland (UNC-ZH) and the Living Lab in Ageing and Long-Term Care (AWO Limburg), and garden and landscape architect Els Beekhuis van der Weijde.

The study aims to understand the effects of garden use and its implementation in the daily lives of people living with dementia in nursing homes. Do you want to learn more about this study? Scan the QR-code.

This toolkit consists of the foundations, the design process, a roadmap and the Nursing Home Garden Checklist. All were developed based on this research.

This toolkit is a living document designed to optimize nursing home gardens. This is a dynamic process and feedback is greatly appreciated. Feedback regarding the garden can be sent to Els Beekhuis van der Weijde (els@bureau-weijde.nl) and feedback regarding the process to Melanie van der Velde-van Buuringen (unc-zh@lumc.nl).

Foundations

Stakeholders

Who do you need to design a nursing home garden?

- The board
- Location manager
- Project team:
  - The commissioner of the project / Principal
  - Project manager
  - Project management support person
  - Garden and landscape architect
  - Organization's housing manager
  - Elderly care physician
  - Psychologist
  - Occupational therapist
  - Team managers/welfare managers
  - (Care) staff representative(s)
  - Client representative(s)
  - Family representative(s)

Step-by-step procedure

Before getting started with the roadmap of this toolkit, it is important to establish the following preconditions:

- ☑ Approval from the board to start the project
- ☑ Approval from location manager
- ☑ Approval from / information to client council
- ☑ Formation of project team
  - First meeting: Establish roles and responsibilities of all parties involved, as well as working arrangements
  - Second meeting: Establish plan of action (at a minimum: Investment in terms of hours, money, time schedule)
  - Start with toolkit roadmap

Design process

Step 1 Program of Requirements

The members of the project team work together to draw up a program of requirements. Who will be the user groups of the garden? Will people from outside the nursing home be able to use the garden? To what extent will the garden be freely accessible to the nursing home residents?

Step 2 The Nursing Home Garden Checklist (NHGC)

The Nursing Home Garden Checklist (NHGC) is based on factors that affect the daily use of the garden. It is completed by at least 3 members of the project team, one of whom must be the garden and landscape architect. Elements on which members of the project team have provided different answers must be discussed. The results of the requirements program and the checklist are interpreted by the garden and landscape architect, who will then translate them into a first draft version of the garden improvement plan.

Step 3 Survey

All project team members review and discuss version 1 of the draft garden improvement plan. They then decide which questions they want answered by the garden's user groups. These user groups may include clients, (in)formal caregivers, volunteers, and others. These questions can then, for example, be collected in a survey and distributed to all user groups. Another option is to conduct semi-structured interviews.

Step 4 In-house expertise

The garden and landscape architect translates the survey results into version 2 of the draft garden improvement plan. This second version is discussed with representatives from various disciplines within the organization, such as occupational therapists, physical therapists, and psychologists. Their expertise covers different aspects of garden use, for example, regarding safety and experience.

Step 5 Definitive improvement plan

The garden and landscape architect translates the outcomes of the feedback from the various disciplines into version 3 of the draft garden improvement plan. This version is discussed with all members of the project team. The garden and landscape architect then translates the results of this final discussion into a definitive version of the garden improvement plan..

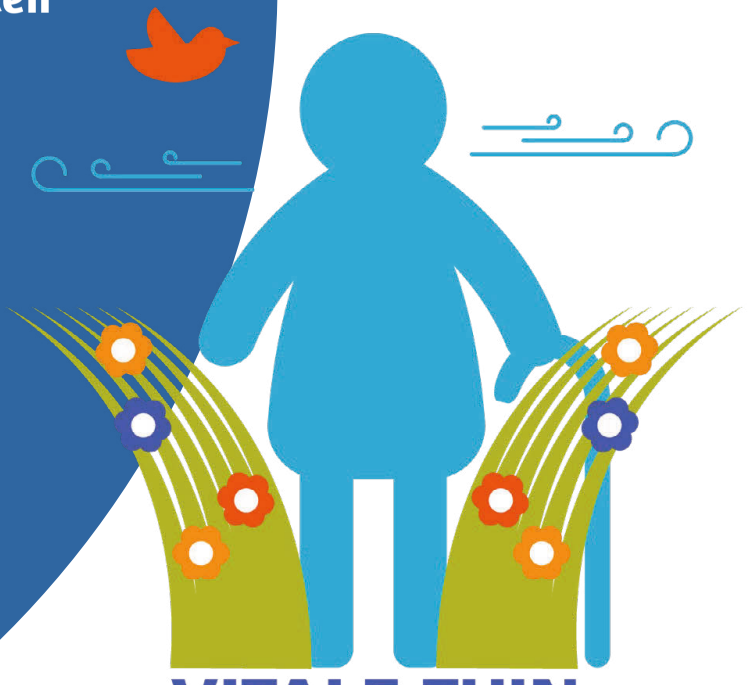
Step 6 Evaluation

One year after the garden has been realized, the NHGC is completed again by at least 3 members of the project team, which must include the garden and landscape architect. The results are compared with the previous year. Any action points are assigned.

Roadmap

Step	Action	Who
1	**Draw up the Program of Requirements**	Project team
2a	**Complete the Nursing Home Garden Checklist (NHGC)**	At least three members of the project team, which must include the garden and landscape architect
2b	**Discuss results of the NHGC and find consensus on differences**	The same three members of the project team, which must include the garden and landscape architect
2c	**Draw up version 1 of draft garden improvement plan**	Garden and landscape architect
3a	**Discuss version 1 of draft garden improvement plan**	Project team
3b	**Decide which questions should be answered by the user groups (for example, clients, (in)formal caregivers, and volunteers) of the garden**	Projectteam
3c	**Prepare and distribute a Survey to all user groups. Another option is to conduct semi-structured interviews**	Project team
3d	**Discuss results of survey/semi-structured interviews**	Project team
4a	**Prepare version 2 of draft garden improvement plan**	Garden and landscape architect
4b	**Discuss version 2 of draft improvement plan garden with in-house experts**	Representatives from different disciplines within the organization, such as occupational therapists, physical therapists and psychologists, who have expertise in different areas in garden use. For example, regarding the topics of safety and experience.
5a	**Prepare version 3 of draft garden improvement plan**	Garden and landscape architect
5b	**Discuss version 3 of draft garden improvement plan**	Project team
5c	**Formulate definitive version of the garden improvement plan**	Garden and landscape architect
6	**Evaluation using the NHGC**	At least three members of the project team, which must include the garden and landscape architect

De Nursing Home Garden Checklist (NHGC)



1.

Accessibility: physical, cognitive, and permission

Residents should be able to go outside independently and unhindered, into the garden or onto the balcony. Ideally, everyone should have the possibility to go outside to a garden where risks are minimized. This will often mean that the garden is enclosed.
This theme is divided into three parts

1. Physical accessibility (can I go outside?);
2. Cognitive accessibility (am I aware that I can go outside, do I know how and does the idea appeal to me?);
3. Permission to go outside (am I allowed to go outside?).

1.1	**Accessible garden, physical: can I go outside?**	
1.1.1	Every resident can go outside into the garden or onto the balcony, with assistance if necessary.	
1.1.2	There is a direct connection between the living area (an area where residents spend most of their time) and the outdoor area. This connection is as short as possible.	
1.1.3	Opening the door does not require much effort or strength.	
1.2	**Accessible garden, cognitive: am I aware that I can go outside, do I know how and does the idea appeal to me?**	
1.2.1	The garden can be seen from inside the building.	
1.2.2	The door to the garden is clearly visible and you can see that it leads to the garden.	
1.2.3	Near the door is an area with a coat rack, clearly recognizable to residents as a coat rack.	
1.2.4	In case it rains outside, umbrellas, raincoats and rain boots are available at the coat rack, ready to use. These may be the residents' personal items, or extra second-hand items.	
1.2.5	In case it is cold outside, blankets, hats, scarves, and mittens/gloves are ready to use at the coat rack. These can be residents' personal items, or extra second-hand items.	
1.2.6	A toilet is located near the entrance and is clearly recognizable as such to residents.	
1.2.7	There are signs in the garden indicating where the toilet is located.	

1.2.8	Next to the entrance is a seating area that is clearly visible.	
1.2.9	The contrast between outside and inside is minimal. Difference in brightness is prevented, for example with a sunshade or pergola.	
1.2.10	Residents perceive the garden as being safe.	
1.2.11	There is an option for emergency communication when residents are out of sight of staff.	
1.3	**Accessible garden: permission (am I allowed to go outside?)**	
1.3.1	Employees agree that the garden has a predetermined safety level.	
1.3.2	Relatives agree that the garden has a predetermined safety level.	
1.3.3	The door is always open during the day, for example, between 10:00 and 16:00 hours. At other times residents can also go outside, but the door is closed and more assistance is therefore needed.	
1.3.4	There is no draft when the door is opened.	
1.3.5	The garden is visible from inside the building (staff can see the resident).	

2.

Safety

The garden should not present any danger to the residents that has not been discussed and accepted first. So the garden has a predetermined level of safety. Remember that it is impossible to make a garden 100% safe, just as it is impossible to make the building itself 100% safe. Risks are a fact of life. This theme consists of two elements:

1. **A safe garden:** If the garden is not perceived as safe, residents will not feel free to use the garden, making it inaccessible, see point 1. For a garden to be used, the first requirement is therefore that it is a safe garden.
2. **A pleasant garden:** The second element of a safe garden is the feel of the garden. Is it a pleasant place where people want to be, even in bad weather?

2.1	Safe garden	
2.1.1	It is not easy to walk out of the garden and leave the grounds.	
2.1.2	Any necessary fences are incorporated in the greenery, match the green surroundings, or provide a nice view of the surrounding area. An alternative can be natural end points to the garden, such as a shed, conservatory, seating area or water point.	
2.1.3	Gates are properly locked, high enough and concealed if possible.	
2.1.4	Doors and gates that are recognizable as such, are also accessible to residents.	
2.1.5	The surface is as flat as possible, with as few edges or indentations as possible..	
2.1.6	There are no changes in colour or differences in colour intensity in the walking direction of the pathway (these are considered barriers).	
2.1.7	The pathways are free of obstacles. Any unavoidable obstacles are marked with a contrasting colour.	
2.1.8	The surface is not shiny, too light (due to reflection of sunlight) or light grey (take vision problems into account).	
2.1.9	The edges of pathways are clearly visible. They can be darker or lighter, including greenery (e.g., grass).	
2.1.10	Pergolas or other structures do not create confusing shadow patterns on the ground.	

2.1.11	If the surface is not level, a handrail is provided.	
2.1.12	Pathways are wide enough (at least 150 cm). They may occasionally be narrower, but never less than 90 cm.	
2.1.13	The maximum inclination is 1:25 (4%).	
2.1.14	Any small stairs must be clearly visible, have a handrail and be in clear contrast with the surroundings. Handrail: between 850 mm and 950 mm high. Possibility of a second handrail at 600 mm. It should be no more than 50 mm in diameter and must be placed at least 50 mm away from a wall. In addition, alternative ways to get to your destination may consist of, e.g., cordoning off part of the stairs at a fair distance using an attractive stairgate, which shows you have to walk around the gate to get to the stairs.	
2.1.15	There are no plants with poisonous berries within easy reach in the garden.	
2.1.16	There are no sharp textured plants next to the pathway (some grasses can be very sharp).	
2.1.17	It is not possible to lose your way in the garden, you can see where you are going.	
2.2	**Pleasant garden**	
2.2.1	The residents have a clear overview over the green, natural, biodiverse environment.	
2.2.2	The garden has an area where you can sit by yourself quietly and sheltered.	

2.2.3	There is a part of the garden where you can be with other people.	
2.2.4	There are seats where you are protected from the wind.	
2.2.5	It is possible to sit in the sun (preferably in the morning and late afternoon).	
2.2.6	In the afternoon, it is possible to sit in the shade. Preferably shade from a tree or pergola, but at least a parasol. These must be simple parasols, which anyone can operate.	
2.2.7	It is possible to sit outside and stay dry when it rains.	
2.2.8	There are enough seats (at least every 100 metres).	
2.2.9	The seats can be used without assistance. (They have different heights because everyone is different, as well as (arm) rests)	
2.2.10	There is space for wheelchairs or mobility scooters next to each seat.	
2.2.11	There are seats with soft cushions that are clean and dry.	
2.2.12	From each seat, the next seat is already visible.	
2.2.13	Each seat has an interesting view. Each seat has a different view.	

2.2.14	The garden has enough intimacy, and there are sufficient seats where you can feel "at home", "normal" and "away from the nursing home for a while".	
2.2.15	The design of the garden matches what residents need: experience and recognition. There is a balance between feeling at home, peace and harmony, and adventure and excitement. Active versus passive.	
2.2.16	Garden furniture and other elements are recognizable to residents.	
2.2.17	It is not possible to walk behind the seats. From the seat, you have a view of as much as 6 metres.	
2.2.18	There is sufficient privacy in the garden, taking into account being visible from the building.	
2.2.19	There is no noise pollution from, for example, roads, air conditioners or a generator.	
2.2.20	There is no odour nuisance from, for example, a factory or a broken sewer system.	
2.2.21	It is not difficult to be able to eat and have a drink outside. For example, by providing water jugs and glasses.	

3.

Orientation

One very important aspect of resident autonomy in the garden is determined by the extent to which the garden can be interpreted by the resident. Three things should be very clear in any garden:

1. How do I access the garden;
2. Which route can I take in the garden; and
3. How can I leave the garden and re-enter the building?

Clarity regarding these three things can be achieved through careful design focused on visual guidance. Landmarks can be extremely helpful. For example, a sculpture, a bridge, a tree, a playground, animals, etc. Anything you would mention when giving directions to someone. Make sure that the right landmarks are also placed at the correct height. People are generally more inclined to look down rather than up.

3.	Orientation	
3.1	It is easy to see where in the garden you are in relation to the door.	
3.2	It is possible to walk at least one but preferably several different routes without having to turn back.	
3.3	A logical, easy to follow pathway takes you back to the door.	
3.4	You see greenery by the door that leads to the garden	
3.5	Landmarks along the pathway make it easy to remember the route.	
3.6	In case of a larger garden, the pathway is marked clearly. The markings are placed below a height of 120 cm.	
3.7	It is easy to find your way back to the door that leads into the building.	
3.8	If there are multiple doors: Each door has its own distinctive characteristics.	
3.9	The garden is welcoming. It invites you to enter the garden and to walk further into the garden.	
3.10	While walking, you clearly experience the transition from one part of the garden to another. For example, at a little bridge, a pergola, or an overgrown arch.	

3.11	To avoid dead ends, there is always something at the end of a path. For example, a seat, a sculpture, etc.	
3.12	There are various garden features, and they are visible from a distance.	
3.13	If the garden is accessible at night: There is sufficient lighting to find your way around. These lights do not blind you or create unpleasant shadows.	
3.14	14 If the garden is not accessible at night: The garden is pleasantly lit so it is enjoyable to look at from inside the building.	
3.15	The garden is interesting and welcoming. The design is clear, but it is not boring.	
3.16	plan of the garden is available. For example, at each access point to the garden.	

4.

Social interaction

An important characteristic of an accessible garden is that it enables social interaction. The opportunity to meet other residents, family, friends and family carers is essential. Are there elements that can help start a conversation? Trying to focus on something other than yourself is known to stimulate communication. Interaction with animals can be a valuable addition to an accessible garden. As can having a connection with a day care centre, school or just the neighbourhood. However, it is also important that part of the garden remains a quiet place without 'forced' social interaction. Try to turn garden work into an experience for residents also, preferably during the day. For example, by making sure that there are chairs near where the work is being done and that the gardeners are in for a chat. Also, let the residents know when something is going on in the garden so they can watch if they want to.

4.	Social contact	
4.1	The garden has terraces, where a larger group of people can gather to sit and relax, have a drink or something to eat.	
4.2	There are smaller seating areas for groups of 2 or 3 people to sit.	
4.3	These smaller seating areas provide a sense of security, are cosy and have plenty of greenery.	
4.4	There is space for wheelchairs next to the benches or next to the table.	
4.5	Pathways are wide enough (at least 150 cm) to allow walking side by side, even with a wheelchair. Occasionally they can be narrower, but never less than 90 cm.	
4.6	There is a quiet place in the garden where staff can take a break without any residents being there.	
4.7	It is possible to have a drink or something to eat (or it is possible to bring some from inside).	
4.8	There is an area in the garden where it is possible to have a meal together.	
4.9	There is an opportunity for grandchildren to play in the garden.	
4.10	If there is a school or nursery nearby, they may also get access to the garden.	
4.11	There are petting animals in the garden.	

4.12	There are works of art in the garden. Ideally, they are changed regularly (including their location) so that they continue to attract attention.	
4.13	These works of art are chosen based on their ability to get a conversation going.	
4.14	The art does not evoke fear; takes into consideration that residents may no longer be able to read the context.	
4.15	Staff have the opportunity to do part of their work outdoors.	
4.16	Staff are encouraged, and supported, to do part of their work outdoors.	

5.

Meaningful activities

A large garden also provides space for a variety of activities. These activities should be tailored to the preferences, abilities and wishes of the residents and their loved ones. These can be things they used to do together, for example, the residents' talents or hobbies. There must be activities for all, keeping in mind all genders. It is important that the garden is a pleasant place for staff and visitors also. This increases the likelihood of residents going outside. For residents who do not want to participate in an activity, these activities should not be a barrier to going outside.

Provide variety in the level of liveliness. This can be done by placing several smaller tables instead of one very large one in the garden. One very large table can at times result in too many people being there. This in turn results in too much noise or residents not having a good overview. All activities should be suitable for the location. Activities should be compatible with the philosophy and culture of the location.

5.	Meaningful activities	
5.1	There is a work area, which is also wheelchair accessible. The work area can also be used on sunny days.	
5.2	The work area can also be used on rainy days.	
5.3	There is a covered area, preferably overlooking the garden, where residents can work with plants.	
5.4	There are animals to care for (or residents can watch how they are being cared for).	
5.5	There are chickens, and it is possible to collect eggs.	
5.6	There is an outdoor tap, (rainwater) cistern or watering can to water the plants.	
5.7	There is a herb garden (raised if possible) where people can feel, smell, pick or water herbs.	
5.8	There is a vegetable garden (raised if possible) where people can feel, smell, pick or water vegetables.	
5.9	There is a flower garden (raised if possible) where people can feel, smell, pick or water flowers.	
5.10	There is fruit to pick or eat in the garden.	

5.11	Residents and staff have the possibility to work in the garden (collect leaves, cut the grass).	
5.12	Everything that is needed for meaningful outdoor activities is in a logical and visible place near or in the garden, complete and readily available. For example, a rack with brooms and rakes, boxes with items for creative activities, etc.	

6.

Reminiscence

Seeing and experiencing things from the past can be a good stimulus. It can be a topic of conversation, provide a sense of familiarity and it can also improve contact with loved ones. An effective garden that takes this into account requires knowledge about the residents' background. What did their own garden look like in the past? Do they recognize plants? What activities were they engaged in in the past?

6.	Reminiscence	
6.1	The garden contains plants and garden furniture that residents used to have in their own gardens	
6.2	Take the background of residents into consideration and integrate the local philosophy and culture of the location into the design.	

7.

Stimulating the senses

The garden is also a place to stimulate the senses. Subtle stimuli can play an important role. Be aware of over- or understimulation. Distribute the stimuli across the garden. Don't concentrate them in one location but use them to encourage people to move through the garden.

7.	Stimulating senses	
7.1	There are plants in the garden that have a distinct smell. These plants can be touched.	
7.2	The garden contains plants that can be 'stroked'.	
7.3	There are flowers in the garden for picking. These flowers are easily accessible and can also be taken inside.	
7.4	Residents are aware that flowers can be picked to take inside.	
7.5	The garden contains a colourful contrast of plants, of different heights.	
7.6	The garden is attractive to birds, butterflies, and insects (there are berries, trees, bushes and lots of flowers all year round).	
7.7	You can hear the leaves in the wind.	
7.8	There is a pathway leading from sun to shade: you feel the difference in temperature.	
7.9	There is a water element in the garden, at a convenient height to be touched. It is not too noisy.	
7.10	Sensory stimuli such as sand, water or bare feet are present only if they fit the philosophy and are part of the residents' background.	

7.11	There is a water bowl for birds to drink water.	
7.12	The garden has a table for plants and herbs. It has removable trays, so the plants can also be brought inside.	

8.

Orientation to time and place

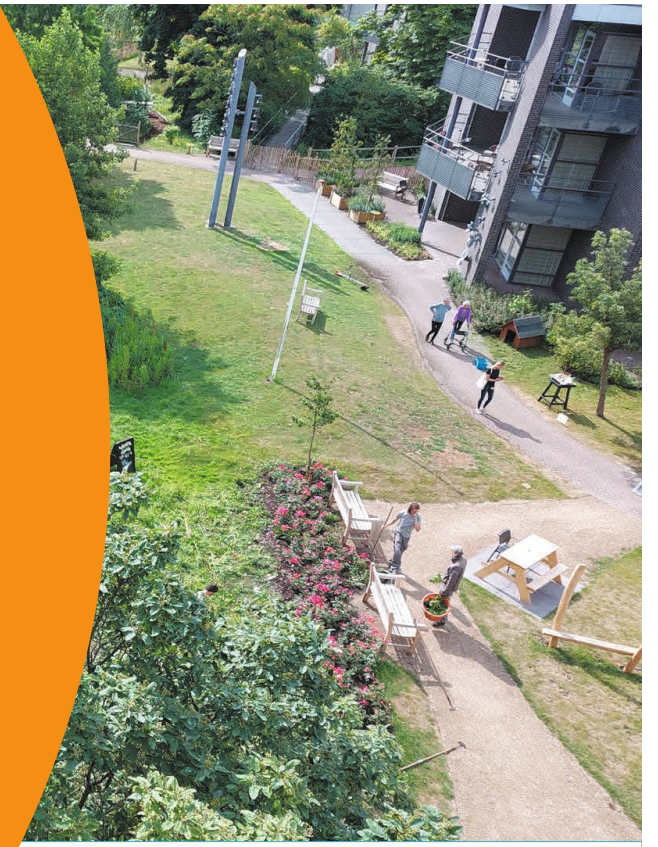
Going outside every day can help to sense what time it is. Sunlight contributes to the ability to tell what time it is. Spending time in the morning and evening sun also contributes to vitamin D production. Afternoon sun should be avoided (see point 2).

8.	Orientation to time and place	
8.1	The plants in the garden indicate which season it is.	
8.2	The garden has interesting features for every season.	
8.3	The garden consists of various sections, each with their own atmosphere.	
8.4	The garden has its own character and fits well with the life philosophy and background of the residents.	
8.5	The size of the elements makes you think you're in a garden.	
8.6	It is possible to look at the outside world from the garden.	
8.7	The garden is linked to local culture in terms of plant species and ornaments.	

9.

Sustainability and assurance

A garden is sustainable, which means it is suitable for activities, the garden is meant to last for a long time, and it is flexible (i.e., it can adapt to necessary changes). Sustainability with regard to the city's ecosystem and nature is also relevant.



9.	Sustainability and assurance	
9.1	There is room for organized activities.	
9.2	The garden is adequately maintained.	
9.3	The plants and materials that are used will last a long time and they are sturdy.	
9.4	There is a budget for timely maintenance.	
9.5	The garden contributes to biodiversity.	
9.6	The garden maintenance team has a storage space.	

10.

Greenery

The choice of greenery plays a role in many of the points discussed above. An important aspect here is a well-designed structure for the whole garden. Within this structure, the greenery can change over time. Sound knowledge of how the plants grow and how to maintain them is essential here. It is also important to know which plants are poisonous. Make sure to use plants that the residents recognize.

10.	Beplanting	
10.1	The greenery is planted by a professional.	
10.2	The greenery is maintained by a professional.	
10.3	Changes to the garden will always involve a professional.	
10.4	The ideal contrast between grey and green is 30:70.	
10.5	Use many different types of plants in different colors.	

References

Algemene dagelijkse levensverrichtingen. (z.d.). In Wikipedia. Accessed on 9 juli 2018, Available from https://nl.wikipedia.org/wiki/Algemene_dagelijkse_levensverrichtingen

Andrews, J.(2013) Improving the design of housing to assist people with dementia University of Stirling,The Dementia Services Development Centre.

Andela, G. & Guinée, A. (2006) Vanzelfsprekende schoonheid. Tuin- en landschapsarchitect Hans Warnau. Wageningen: uitgeverij Blauwdruk.

Becker, H.M., (2003) Levenskunst op leeftijd, geluk bevorderende zorg in een vergrijzende wereld. Delft, Eburon.

Berg, A. van den & Berg, M. van den,(2001) Van buiten word je beter. Een essay over de relatie tussen natuur en gezondheid, Wageningen, Alterra.

Berg, A.E. van den (2015). Groen in de zorg: Een quick-scan inventarisatie van het groene zorgaanbod in Nederland. Groenekan: Natuurvoormensen omgevingspsychologisch onderzoek.

van den Berg, E.A., and van Winsum - Westra. M., Ontwerpen met groen voor gezondheid; richtlijnen voor de toepassing van groen in "healing environments", in Reeks belevingsonderzoek. 2006: Wageningen. p. 64.

Bovenberg, F., Takkenkamp, J., Vennik, L. & Francken, G. (2010) Helende omgeving draagt bij aan herstel. Sociale Psychiatrie (2010,94) p 7-14.

Bourdon, E., Belmin, J. (2021) Enriched gardens improve cognition and independence of nursing home residents with dementia: a pilot controlled trial. Alz Res Therapy 13,116 (2021). https://doi.org/10.1186/s13195-021-00849-w

Browning, W.D., Ryan, C.O. & Clancy, J.O. (2014). 14 Patterns of Biophilic Design. New York: Terrapin Bright Green llc.

Chalfont, G., Walker, A., (2013). Dementia Green Care Handbook of Therapeutic Design and Practice. Safehouse books, Lancashire.

Clement, A.J.M. (2014) Samen langer zorgeloos! Eindhoven:TU.

Cohenmansfield, J. (2007) Outdoor Wandering Parks for Persons with Dementia, Journal of Housing for the Elderly.

Cooper Marcus, C. (2007) Alzheimer's Garden Audit Tool, Journal of Housing for the Elderly.

Cullen, G. (1971) The concise Townscape, The Architectural Press, Oxon, New York.

Detweiler, M. B., et al. (2002). Wander Gardens: Expanding the Dementia Treatment Environment

Deenik, J. (2018, 26 mei). Improving health, step by step: physical activity for severe mental illness in the Netherlands. Accessed on 23 juli 2018, Available from https://blogs.bmj.com/bjsm/18/05/26/improving-health-step-by-step-physical-activity-for-severe-mental-illness-in-the-netherlands/

Evans, S.C., et al., Connections with nature for people living with dementia. Working with Older People, 2019. 23(3): p. 142-151.

Fleming, R., Bennett, K., (2017). Dementia training Australia Environmental design resources, University of Wollongong.

Geeter, K. de & Munsterman, k. (2017). LACCS-programma. Accessed on 20 juli 2018, Available from http://www.laccsprogramma.nl/36-inhoud/139-laccs-waarden

Gezondheidsraad & RMNO, (2004) Natuur en gezondheid. Invloed van natuur op sociaal, psychisch en lichamelijk welbevinden. Den Haag: GR, publicatie nr 2004/09; RMNO, publicatie nr A02a

Gezondheidsraad, (2017) Gezond groen in en om de stad. Den Haag: GR, publicatie nr 2017/05

Giebel, C., de Boer, B., Gabbay, M., Watkins, C., Wilson, N., Tetlow, H., & Verbeek, H. (2022). Developing a Meaningful Garden Space in a Care Home with Staff and Family Members: A Qualitative Study. International journal of environmental research and public health, 19(12), 7025. https://doi.org/10.3390/ijerph19127025

Graham-Cochrane, T. (2010). Gardens that care: Planning outdoor environments for people with dementia. Alzheimer's Australia SA. http://www.enablingenvir onments.com.au/uploads/5/0/4/5/50459523/gardens_that_care.planning_outdoor_environments_for_people_with_dementia.pdf

Grant, C.F. & Wineman DArch. J.D., (2007) The Garden-Use Model, Journal of Housing for the Elderly

Haas, G.J.F. de, (2011) Leren met een beperking; ABC.Theorie en toepassing.

Haas, G.J.F. de (2017, 12 december). Gert-Jan de Haas over het brein en complex gedrag op CCE Podium. Accessed on 10 juni 2018, Available from https://www.cce.nl/over-cce/actueel/gert-jan-de-haas-over-het-brein-en-

complex-gedrag-op-cce-podium

Hamel, R.,(2009) Ontwerpen voor de gebruiker, het nut van omgevings-psychologische expertise in het ontwerpproces, artikel in topos/02/2009 UVA

Haug, J.J.M. &.Schuurman, F. (2017)Voetpaden voor iedereen. Bouw Advies Toegankelijkheid, Utrecht.

Hendriks, I.H., et al., Nature and dementia: development of a person-centered approach. International Psychogeriatrics, 2016. 28(9): p. 1455-1470.

Huber, M.,Vliet, M. van & Boers, I. (2016) Heroverweeg uw opvatting van het begrip 'gezondheid' NED TIJDSCHR GENEESKUNDE (2016;160, 1-5).
Intramurale zorg.(z.d.). In Wikipedia. Geraadpleegd op 10 juni 2018, van https://nl.wikipedia.org/wiki/Intramurale_zorg.

Jansen, S.J. (2009),Technologie in de verstandelijk gehandicaptenzorg. Onderzoek naar het arbeidsbesparende vermogen van toezichthoudende technologie in de nachtzorg. scriptie Master Health Care Management / Health Sciences, Universiteit Twente, Enschede.

Karmanov, D.(2009) Feeling the Landscape Six Psychological Studies into Landscape experience, PhD thesis Wageningen

Lemaire, T. (1970). Filosofie van het landschap. Baarn:Uitgeverij Ambo b.v.

Lynch K. (1972) What time is this place,Massachusset, MIT Press.

Mul, F. (2018,10 juli). Verplichting buitenruimte bij wonen met zorg komt terug. Accessed on 16 juli 2018, Available from https://www.vgn.nl/ artikel/26811

Motealleh, P., Moyle, W., Jones, C., Dupre, K. (2021)The Impact of a Dementia-Friendly Garden Design on People With Dementia in a Residential Aged Care Facility: A Case Study, Health Environments Research & Design Journal 2022, Vol. 15(2) 196-218 2021.

NHS (2018). What is dementia? Accessed on 16 juli 2018, Available from https://www.nhs.uk/ conditions/dementia/about/

Nicholas, S.O. , A.T. Giang, and P.L.K. Yap, The Effectiveness of Horticultural Therapy on Older Adults: A Systematic Review. Journal of the American Medical Directors Association, 2019. 20(10): p. 1351.e1-1351.e11.

Nillisen, J. & Opitz, S. (2013). Dimensie voor dementie. Kleinschalige woonvormen voor dementerende ouderen. Arnhem: Wiegerinck.

NVTL (2010) Gezond Ontwerp! De betekenis van tuin en landschapsarchitectuur in de zorg. Amsterdam, NVTL.

Oldenburger-Ebbers, C.S. ,Backer, A.M. & Blok, E. , (1995). Gids voor de Nederlandse Tuin- en landschapsarchitectuur. Rotterdam: Uitgeverij De Hef publishers.

den Ouden, M., et al., Daily (In)Activities of Nursing Home Residents in Their Wards: An Observation Study. J Am Med Dir Assoc, 2015. 16(11): p. 963-8.

Paus Franciscus (2015, 24 mei). Laudato si' - 'Wees geprezen' - over de zorg voor het gemeenschappelijke huis (p.150). Accessed on 21 juli 2018, Available from https://www.rkdocumenten.nl/rkdocs/

Plaats, A. van der (2017, 7 juni). Ontstaansgeschiedenis. Accessed on 01 juli 2018, Available from http://breincollectief.nl/

Pollock, A.& Marshal, M.,(2012) Designing outdoor spaces for people with dementia., University of Stirling, The Dementia Services Development Centre.

Pollock, A. with Cunningham, C., (2018) The room outside., HammondCare Media, Edinburgh, Scotland.

Roncken, P.A., (2018) Shades of sublime a design for landscape experiences as an instrument in the making of meaning. Wageningen: Wageningen University.

Staats, H. (2002). Omgevingspsychologie in de ruimtelijke ordening. Welbevinden als functie van drie ruimtelijk bepaalde criteria. Leiden: Werkgroep Energie- en Milieuonderzoek. Universiteit Leiden (extern rapport, 34 pg.).

Steenhuis, M & Hooimeijer, S.,(1992) Maakbaar landschap Nederlandse Landschapsarchitectuur 1945-1970, Rotterdam, NAI uitgevers

Stichting Voorall, (2016) Richtlijnen 'Paden in parken en natuurgebieden'. Den Haag

Stigsdotter, U.& Grahn, P. (2009) What Makes a Garden a Healing Garden? Journal of Therapeutic Horticulture (2009 XIX), p 60-69.

Stuart Smith, S., (2020) The well gardened mind. Rediscovering nature in the modern world. London, William Collins / Harper Collins Publishers.

Tavenier, M. (2012, 20 november) Revalidatietuin centrum voor reuma en revalidatie Rotterdam (CRRR) GAccessed on 28 juli 2018, Available from http://marnixtavenier.nl/2012/11/revalidatietuin-hillegersberg/

Timmers-Huigens, D. (1995) Mogelijkheden voor verstandelijk gehandicapten. STAD:Lemma., samenvatting p.42-45

van der Velde-van Buuringen, M., W.P. Achterberg, and M.A.A. Caljouw, Daily garden use and quality of life in persons with advanced dementia living in a nursing home: A feasibility study. Nurs Open, 2020.

van der Velde-van Buuringen, M., R. Hendriks-van der Sar, W.P. Achterberg, and M.A.A. Caljouw, The effect of garden use on quality of life and behavioral and psychological symptoms of dementia in people living with dementia in nursing homes: a systematic review. Frontiers in Psychiatry, 2023. 14.

Vereniging Gehandicaptenzorg Nederland (2017). Feiten en cijfers. Geraadpleegd op 16 juli 2018, van https://www.vgn.nl/feitenencijfers.

Vlug (2013). Het ontwerp voorop Landschapsarchitectuur in een nieuwe tijd. In J. Vlug, A. Noortman, R. Aben, B. ter Mull & M. Hendriks(red.).De noodzaak van ontwerpen. Veldverkenningen in de Nederlandse landschapsarchitectuur, (p 8-15). Velp: Hogeschool Van hall Larenstein.

Vroom, M.J., (1967) Het Landschap onze tuin

Vuksanovic, B., Castelijns, M. & Bavel, M. van. (2013) IMPACT – Samen ontwerpen aan betere gebouwen voor de geestelijke gezondheidszorg. Van Aken architecten BNA Onderzoek. https://www.bna.nl/bna-onderzoek/kennisbibliotheek/

Wouwe, H.van & Weerd, D. van de (2001).Triple-C Herstel van het gewone leven. Accessed on 9 juli 2018, Available from http://www.methodieken.nl/methodieken_methoden.asp?methode_Triple-C-Herstel-van-het-gewone-leven

Zeisel, J. (2006) Inquiry by Design Environment, Behavior, Neuroscience in Architecture, Interiors, Landscape and Planning. New York - London: W.W. Norton & Company

Zeisel, J. (-) Dr. John Zeisel. Accessed on 1 juli 2018, Available from https://www.imstillhere.org/ About/dr-john-zeisel

Zevenbergen, H. (2012, 14 augustus). De lichaamsgebonden ervaringsordening. Accessed on 26 juli 2018, Available from http://www.platformemg.nl/publicatie/ de-lichaamsgebonden-ervaringsordening/

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7

General discussion

This chapter outlines the main findings of the studies in this thesis, reflects on these findings by placing them in a broader perspective, describes some of the methodological considerations, and presents implications for clinical practice, education, policy, and future research.

SUMMARY OF MAIN FINDINGS

The overall aim of the studies presented in this thesis was to gain a better understanding of how garden use can be integrated into daily nursing home practice. The following three research questions were addressed in this thesis:

1. What is the effect of garden use on quality of life, neuropsychiatric symptoms, and daily life?

Chapter 2 provides a narrative summary of 19 publications, describing 17 studies and three types of interventions regarding (1) evaluation of the effects of specifically designed nursing home gardens; (2) participation of the people living with dementia in outside activities; and (3) other interventions, for example, garden visits and different seasons. Overall, these studies appear to suggest positive effects of garden use on quality of life (QoL), behavioral and psychological symptoms of dementia (BPSD), or other outcomes related to QoL or BPSD (stress, sleep, and mood) of people living with dementia in nursing homes. **Chapter 4** describes a two-week intervention involving daily garden use by people living with dementia in an existing green nursing home garden. An increase in positive affect and a decrease in social isolation were observed during the intervention period, and a decrease in negative affect was observed during the follow-up period. **Chapter 5** showed that a multicomponent garden use intervention in a nursing home - incorporating physical, social, and organizational environmental components – had some positive effects on daily life and QoL. While using the new garden, people living with dementia spent less time on passive and meaningless activities, and more time on social activities compared to when they did not use the garden. Significant QoL improvements were limited to social relations.

2. How often do people living with dementia in nursing homes go outside and which resident characteristics are associated with the frequency of going outside?

Chapter 3 showed that approximately two-thirds of people living with dementia in nursing homes go outside often, and one-third rarely or never go outside. Five factors were independently associated with the frequency of going outside. The findings revealed that participants who go outside often receive daily or weekly visits, have a higher positive affect, have less severe physical impairment, do not take pain medication, and feel less at home. Further analyses showed that the variable severity of physical impairment explained the largest portion of the variability in the frequency of going outside. **Chapter 5** revealed a slight

improvement in garden use directly after the multicomponent garden use intervention, which declined to baseline levels during follow-up. People living with moderate dementia used the garden significantly more, whereas those with severe dementia used it the least.

3. How should a nursing home garden be designed?
In **Chapter 6** the development process of the Nursing Home Garden Toolkit is described. This toolkit was developed as part of the Vitality Garden study in **Chapter 5**, one component of which was designing a nursing home garden based on evidence-based practice. The toolkit consists of: a) an introduction, b) the foundations, c) the design process, d) a roadmap, e) the Nursing Home Garden Checklist (NHGC), and f) a reference list. In **Chapter 4** we observed that most activities that were done during garden use were usual activities in daily nursing home practice, such as sitting, walking, and drinking beverages.

MAIN FINDINGS IN A BROADER PERSPECTIVE

In summary, garden use has small but positive effects on aspects of quality of life (QoL), neuropsychiatric symptoms, and daily life of people living with dementia in nursing homes (**Chapters 2, 4, and 5**). Approximately one-third of people living with dementia in nursing homes rarely or never go outside. It seems that the more they rely on the care environment, the less they can go outside (**Chapters 3 and 5**). A slight improvement was observed directly after a multicomponent intervention to improve garden use. However, this effect had dropped to baseline levels one year later (**Chapter 5**), despite the intervention being based on scientific recommendations and the garden design following evidence-based practice (**Chapter 6**). Why did the improvements decline to baseline levels one year after the intervention? And should garden use not be considered a part of daily life as well as a therapeutic approach for people living with dementia, given its positive effects? The following section will address these topics in depth.

Challenges in implementing a multicomponent garden use intervention

Nursing homes can be seen as complex social ecosystems, a kind of living organism comprised of interconnected subsystems where physical, social, and organizational environmental components interact.[1, 2] Changes to one of these environments, such as redesigning the nursing home garden or implementing a new way of working, by definition disrupts the ecosystem's fragile balance .[1] Therefore, it is important to carefully develop and implement interventions in order to enable positive and sustainable changes while preventing undesirable outcomes as much as possible. Research has shown that joint alterations to the physical, social and organizational environment that support each other, can lead to sustainable changes that benefit all stakeholders.[3] But why did the

improvements decline to baseline levels one year after the intervention, as we saw in **Chapter 5**, even though the intervention incorporated physical, social, and organizational environmental components?

Struggles…
Changes to the physical environment are relatively straightforward to implement, but social and organizational interventions can face substantial obstacles (**Chapter 5**). The complexity of the research interventions, and their compatibility with existing nursing home work routines are significant factors influencing the success of implementing the research interventions.[1] Targeting a modification of work routines as part of a complex intervention, such as working outside part of the day, poses a significant barrier that influences implementation success. This is one reason why incorporating daily garden use does not have to imply an additional task; rather, it implies rearranging priorities and doing the usual activities outside part of the time (**Chapter 4**). Nevertheless, caregivers may struggle to incorporate such behavioral and routine changes into the daily nursing home practice. Individual characteristics, such as caregivers' motivation and capability to modify their work routines, play a role in this.[4] But so do broader organizational factors, such as high staff turnover, existing rules and regulations, and limitations in time and money.[1, 5, 6] On top of that, external factors, such as issues with care technology, and worsening weather conditions, can also contribute to these struggles (**Chapter 5**).

Some of these struggles can be overcome by the manager, who can actively support caregivers to work part of the day outside by creating a suitable organizational environment and helping to set priorities.[3, 7] Leadership style, creating a positive atmosphere, and stimulating collaboration are also potential facilitators.[3] In addition, nursing home organizations should further develop their competencies to co-develop and execute complex interventions.[4, 8]

…with a 'wicked' character
Thus, the development and especially the implementation of complex, multicomponent interventions in nursing homes present significant challenges, particularly when targeting not only the physical environment, but also social and organizational aspects (**Chapter 5**). The question arises whether the struggles experienced during such large-scale changes in nursing homes can be considered problems with a 'wicked' character.[9] 'Wicked problems' are problems that are difficult or impossible to solve because of their complex and changing nature.[9]

The complex interplay between care policy, regulations, and the design of the building and garden, plays a crucial role in the extent to which garden use is facilitated. While these are primarily design and development factors, their influence

continues into the implementation phase. In addition, staffing, workload, and the amount of time staff is given for training and experimenting with independent garden use determine the extent to which caregivers can guide and support people living with dementia in using the garden. These challenges are closely tied to the implementation process, highlighting how even a well-developed intervention can fail without sufficient resources or support.

Also, the needs and wishes of people living with dementia are very diverse and change over time, which makes a uniform approach to implementing garden use challenging. The multiple stakeholders involved in implementing garden use all have their own perspectives and interests, such as quality of life, workload, and finances. What works in one nursing home may not work in another, even within the same organization, due to unique contexts and circumstances. And whose responsibility is the implementation of garden use, really? It seems to belong to everyone, but at the same time it belongs to no one.[10]

Thus, people living with dementia in nursing homes cannot go outside whenever they want to, and the mechanisms behind this problem and the possible solutions seem to have a 'wicked' character. This makes it hard to find and implement a clear intervention that is applicable to all nursing homes. While development may provide a promising framework or design, implementation is the real challenge. Researchers and nursing homes must navigate different goals and perspectives, knowledge domains and methodological approaches, and use an interdisciplinary or transdisciplinary approach to find a solution.[11-13]

Garden use as part of daily life ánd as a therapeutic intervention

Innovative living arrangements

This thesis focuses mainly on integrating garden use into the daily practice of traditional nursing homes, where going outside is often a luxury. However, there are also innovative living arrangements that already integrate going outside and being involved with nature into daily practice.[14] Innovative living arrangements aim to improve functioning and quality of life by creating a better fit between the person and the environment through improvements to the physical, social, and organizational environments.[14] One example is the Eden Alternative. One of the principles in this care philosophy is to ensure that life revolves around close and continuing contact with plants, animals and children.[15] Another example are green care farms, which are small-scale living facilities that combine agricultural with care activities, with nature playing a prominent role.[14, 16, 17] The care is based on the idea that residents should be able to participate in daily activities as much as possible.[17] Because of the variety of facilities in the physical environment, such as the presence of animals and plants, residents have more opportunities

to move more freely and to participate in outdoor activities than in traditional nursing homes.[17] Green care farms also encourage going outside and interaction with nature, resulting in a higher frequency of outside-related and nature-related activities than in traditional nursing homes.[14, 17]

Integrating independent garden use into daily nursing home practice allows people living with dementia to actively or passively engage with nature whenever they wish and at their own pace. When integrated successfully, this approach requires minimal professional facilitation, making it a sustainable strategy for nursing homes. However, not every nursing home has an outside space or the resources to create a garden suitable for people living with dementia. Although innovative solutions are available, such as virtual nature experiences, they cannot replace actually being outside in nature.[18, 19] Alternatively, partnerships with local municipalities to create additional outdoor spaces around nursing homes, collaborations with community garden associations, or utilizing nearby parks could be viable alternatives. While these options may require more planning and coordination through a transdisciplinary approach, they can be structurally integrated into the daily nursing home practice, ensuring that residents regularly can go outside and have access to nature.

A therapeutic intervention

Should garden use also be considered a non-pharmacological therapeutic approach for people living with dementia in nursing homes, given the positive effects found on QoL, neuropsychiatric symptoms, and daily life (**Chapters 2, 4, and 5**)?

The only nature-based therapeutic intervention currently used for people living with dementia in nursing homes is horticultural therapy. It involves participating in gardening activities facilitated by a registered horticultural therapist to achieve specific treatment goals.[20] The process itself is considered therapeutic rather than the end product.[20] It can be beneficial for people living with dementia, e.g. by improving positive affect, apathy, levels of engagement, creating a sense of achievement, and lowering stress and levels of the hormone cortisol in the blood.[21-24] Additionally, it can alleviate symptoms that are often treated with psychotropic medications, such as depression, anxiety, and agitation.[21, 25] Unlike some other therapies, horticultural therapy is generally well-received by most people living with dementia, as it encourages them to engage with nature through activities, for example through touch or observation.[25]

Other nature-based therapeutic interventions that could be used for people living with dementia in nursing homes are Nature on Prescription and Shinrin-Yoku, also known as Forest Bathing.

Shinrin-Yoku is a traditional Japanese practice that emphasizes full sensory immersion in nature.[26, 27] Research has demonstrated its beneficial effects on mental health, including reductions in anxiety, depression, stress, and sleep disturbances.[26] However, no studies have yet explored its potential impact on people living with dementia.[27] While integrating Forest Bathing into nursing homes presents logistical and environmental challenges, adapting its core principles - sensory immersion, mindfulness, and nature engagement - to more accessible settings could still provide meaningful benefits. Instead of full immersion in a forest, nursing homes can modify their outdoor spaces to create environments that capture the essence of Shinrin-Yoku.

Nature on Prescription is an initiative in which healthcare providers prescribe nature-based activities to improve mental health.[28, 29] A nature prescription can range from simple advice to spend time in nature more regularly, to more targeted referrals for nature-based interventions, such as structured group walks in nature.[28] It can be used as a preventive measure for, e.g., anxiety, depression, and stress, as well as a non-pharmacological treatment in combination with medication.[28] An example is the Green GGZ Movement in the Dutch mental healthcare system (GGZ), which aims to make nature a standard part of treatment by integrating Nature on Prescription.[30] They start by setting a good example, encouraging mental health professionals to conduct therapy sessions outside in a natural environment.[30] Another example is Scotland, which has incorporated Nature on Prescription into their healthcare system.[31] While Nature on Prescription is gaining recognition as an effective intervention for mental health, its implementation in nursing homes requires adaptation to meet the specific needs of people living with dementia. Simply advising people living with dementia in nursing homes to spend more time in nature is often insufficient. Structured, accessible, and guided activities are necessary to ensure meaningful engagement with the natural environment.

Thus, nature-based therapeutic interventions could be considered a formal treatment for conditions such as anxiety, depression, agitation, and sleep disturbances in people living with dementia in nursing homes. However, implementing these interventions in nursing homes requires adapting them to meet the specific needs of people living with dementia. One possible solution to these challenges is social prescribing. Developed in the United Kingdom by the National health System (NHS) Long Term Plan, the social prescribing approach has expanded to over 20 countries, including the Netherlands.[32, 33] Typically utilized outside long-term care facilities, social prescribing is particularly used in primary care settings such as general practitioners' offices. It provides a formal referral pathway that connects individuals with services that improve well-being.[34-36] By adapting the concept of social prescribing to the specific challenges in

nursing homes and the needs of people living with dementia, interdisciplinary and transdisciplinary collaboration can be facilitated to ensure the effective delivery of nature-based therapeutic interventions.

METHODOLOGICAL CONSIDERATIONS

Outcome measures

Quality of life

The QUALIDEM was used throughout this thesis to assess quality of life (QoL) in people living with dementia in nursing homes. As people in this stage of dementia are often unable to complete self-report assessments, it was necessary to use proxy ratings by caregivers, psychologists, and family. Although proxy assessments are inherently subjective and influenced by the raters' own values and perceptions, the QUALIDEM provides a standardized and validated method for evaluating QoL in nursing homes.[37-39] Despite its strengths, the QUALIDEM is not without limitations.[40] It is susceptible to response biases, where the proxies' perceptions and emotional states may influence their ratings.[41, 42] Furthermore, while the instrument captures broad aspects of QoL, it may not fully account for the individual values of people living with dementia. It also does not integrate mixed-methods approaches, such as a combination of self-report and proxy ratings, which could provide a more nuanced understanding of QoL.[39, 43] Despite these limitations, the QUALIDEM remains one of the most robust and accessible tools available for evaluating QoL in advanced dementia.

Behavioral and psychological symptoms of dementia

The term "behavioral and psychological symptoms of dementia" (BPSD) was introduced in 1996 by the International Psychogeriatric Association (IPA) to define behavioral disturbances in dementia.[44] It replaced the term "behavioral disorders" to encompass a broader spectrum of symptoms, including mood disturbances, delusions, and hallucinations.[44] BPSD is defined as "signs and symptoms of disturbed perception, thought content, mood, and behavior".[45, 46] Despite its prominence in research, BPSD has not been widely adopted in Dutch clinical practice. In recent years, critical concerns have also been raised internationally. [47-49] BPSD implies that all included behaviors and psychological changes are symptoms of dementia, aligning with a biomedical model.[44] However, this contrasts with the biopsychosocial approach, which considers biological, psychological, and environmental interactions.[50] The risk of medicalizing behavior through BPSD terminology is that underlying causes and individual needs are neglected, which may encourage pharmacological interventions while reducing person-centered care.[48, 51] Given these concerns, researchers and clinicians should critically assess the continued use of the term BPSD.[44]

Generalizability to other cultures
It is important to consider whether the findings of the research in this thesis are relevant to other cultural contexts that may have different natural environments, norms, values, and practices related to going outside, garden use and engaging with nature.

Research addressing generalizability in this field is limited. A few studies have examined the effects of exposure to a Japanese garden across different locations, countries, cultures, and ethnic groups.[19, 52] However, Japanese gardens are very different than most of the nursing home gardens used in the studies in this thesis. They are designed for viewing miniaturized landscapes that aim to activate memories of nature.[19] These studies compared the effects of viewing nursing home gardens designed according to traditional Japanese gardening principles on Caucasian people living with dementia in New Jersey, and Japanese people living with dementia in Japan. The studies demonstrated that the positive effects of garden observation were consistent across these varying environments, cultures, and ethnic origins.

A European cross-national study revealed that nursing homes with gardens in all included countries across middle, eastern and northern Europe, were positive about the gardens' effect on the residents' quality of life.[53] They all recognized the gardens' value for physical activity, social interaction, and recreation.[53] Common outdoor activities mentioned across countries were walking, gardening, and simply enjoying the sun.[53] In addition, the need for going outside seems to be present year-round, even in challenging weather conditions, such as the harsh winters typical of Northern European climates.[54]

While these findings are somewhat generalizable to other cultures, more research is needed to understand how local context affects garden use by people living with dementia in nursing homes.

Participation of people living with dementia in research design and execution
In this thesis, the participation of people living with dementia in nursing homes was not actively included in the different phases of the study, which was a missed opportunity. Involving people living with dementia in research is feasible but requires careful methodological consideration. Their active participation can provide valuable insights but it also presents challenges, such as balancing research goals and expectations with the expectations and personal circumstances of the involved person living with dementia.[55] Planning enough time, building trust and developing inclusive methods, such as advisory groups and co-conducting interviews, should address these challenges.[55] This approach promotes a shift

from ‘research on’ to ‘research with’ people living with dementia, thereby improving the quality and impact of the study.[56]

IMPLICATIONS FOR CLINICAL PRACTICE, EDUCATION, AND POLICY

The findings of this thesis have several implications for practice, education and policy. Possible ways to address these are discussed below.

Clinical practice
Garden use should be integrated into daily nursing home practice and also used as a formal treatment for conditions such as anxiety, depression, agitation, and sleep disturbances. As discussed in **Chapter 4**, incorporating daily garden use does not necessarily imply an additional task; rather, it involves rearranging priorities and doing the usual activities outside some of the time. Interventions developed to increase the frequency of garden use should prioritize those people living with dementia who rely most heavily on the care environment (**Chapters 3 and 5**). In addition, the implementation of nature-based therapeutic interventions requires adaptation to meet the specific needs of people living with dementia, for example by social prescribing.

Education
In order to effectively integrate garden use into clinical practice, educational programs for caregivers should emphasize the knowledge and skills necessary to incorporate garden use into daily routines. These programs should highlight the positive effects of garden use not only for people living with dementia but also for the caregivers themselves. Practitioners, such as psychologists, should learn how and when to prescribe nature-based therapeutic interventions. In addition, nursing home organizations should further develop their competencies to co-develop and execute complex interventions.

Policy
Garden use as a daily nursing home practice and as a formal treatment for conditions should be integrated into the nursing home organizations’ vision, policy and care process. To improve garden use, it is important to carefully develop and implement joint alterations to the physical, social and organizational environment. These alterations should reinforce each other through an interdisciplinary or transdisciplinary approach. The toolkit that we developed in **Chapter 6** should guide the design of existing or new nursing home gardens. If no outside space is available adjacent to the nursing home, for instance in urban environments, collaborations can be established with local municipalities and community garden associations.

IMPLICATIONS FOR FUTURE RESEARCH

Involving people living with dementia in study design and implementation
Future research should prioritize the active involvement of people living with dementia in both the design and implementation phases. Their participation can provide valuable insights and ensures that interventions and implementation strategies are tailored to their needs and preferences. This enhances the relevance, quality, and impact of the findings.

Expand research to include people living with dementia at home and in different cultural contexts
The focus should be extended to include people living with dementia at home and examine how garden use and nature-based therapeutic interventions can be meaningfully integrated into their daily lives. In addition, studies should explore the applicability and effectiveness of such interventions across diverse cultural contexts, taking into account differences in natural environments, social norms, values, and practices. This broader perspective will lead to a more comprehensive understanding of both the benefits and challenges associated with garden use. In this way, future research can contribute to the development of more inclusive, context-sensitive strategies to improve garden use.

Adopting longitudinal designs and integrating process and outcome evaluations
Future research should adopt a longitudinal design that follows specific individuals living with dementia over time. This approach will provide deeper insights into the long-term effects of garden use on quality of life, neuropsychiatric symptoms, and daily activities. With this approach, researchers can gain a better understanding of the variability in responses and identify factors that potentially contribute to positive effects and challenges. Additionally, both process and outcome evaluations should be combined from the beginning of the study. This could help researchers explore how the intervention was developed, executed, and implemented, while also identifying which local, real-world factors could be associated with the observed outcomes.

EPILOGUE – THE CASE OF MRS. ACRELIFE

One year later

...Luckily for Mrs. Acrelife, the nursing home has worked hard over the past year to improve independent garden use.

Now, when she looks out the window and sees a blue sky, she can walk through the open doors, take the elevator, and go outside independently. With the help of the occupational therapist, Mrs. Acrelife has learned to use the elevator; for example, the therapist added colors to the button numbers to make navigation easier. On the ground floor, the route to the garden and the main entrance has been enhanced with landmarks and light to support her wayfinding skills. The garden itself has also been improved using the Nursing Home Garden Toolkit. Although Mrs. Acrelife occasionally loses her way, she rarely feels unsafe, and she is always happy when she spends time in the garden.

The nursing staff on Mrs. Acrelife's ward is very happy that Mrs. Acrelife is now able to go outside independently. In collaboration with the family, elderly care physician, psychologist, and other staff members, the potential risks of independent garden use were discussed and documented in Mrs. Acrelife's electronic patient record. This allows the nursing staff to confidently allow Mrs. Acrelife to go outside, even though it can still a bit nerve-wracking for them.

When the nursing staff see Mrs. Acrelife walking toward the elevator, they keep an eye on her, until she goes into the elevator and descends to the ground floor. They then call their colleagues on the ground floor to inform them and ask them to monitor Mrs. Acrelife. Mrs. Acrelife walks through the garden for a bit and then sits on a bench to enjoy the sunshine. She listens to the birds and the rustling of the leaves in the trees, and she watches other residents walk through the garden. About half an hour later, a volunteer brings her back. Tired but content, Mrs. Acrelife sits down in a chair to take a nap.

REFERENCES

1. Peryer, G., et al., *Contextual factors influencing complex intervention research processes in care homes: a systematic review and framework synthesis.* Age and Ageing, 2022. 51(3).
2. Rutter, H., et al., *The need for a complex systems model of evidence for public health.* The Lancet, 2017. 390(10112): p. 2602-2604.
3. Rosteius, K., et al., *How the interrelated physical, social and organizational environment impacts daily life of residents with dementia on a Green Care Farm.* Frontiers in Public Health, 2022. Volume 10 - 2022.
4. Damschroder, L.J., et al., *The updated Consolidated Framework for Implementation Research based on user feedback.* Implementation Science, 2022. 17(1): p. 75.
5. Shenkin, S.D., et al., *'Don't let the trial kill the intervention': how can researchers and care home teams implement complex intervention trials in care homes?* Age Ageing, 2022. 51(3).
6. Rusinovic, K.M., et al., *Towards Responsible Rebellion: How Founders Deal with Challenges in Establishing and Governing Innovative Living Arrangements for Older People.* Int J Environ Res Public Health, 2020. 17(17).
7. van Beek, A.P.A. and D.L. Gerritsen, *The relationship between organizational culture of nursing staff and quality of care for residents with dementia: Questionnaire surveys and systematic observations in nursing homes.* International Journal of Nursing Studies, 2010. 47(10): p. 1274-1282.
8. Vilans *13 obstakels om te overwinnen voor structureel innoveren.* 2021.
9. Rittel, H.W.J. and M.M. Webber, *Dilemmas in a general theory of planning.* Policy Sciences, 1973. 4(2): p. 155-169.
10. Borremans-Malm, I. *Ontwerpgericht onderzoek in de Zorg. Wicked problems en ontwerpgericht onderzoek*. [cited 2025 March 26]; Available from: https://jouwscriptiecoach.nl/scriptietips/ontwerpgericht-onderzoek-in-de-zorg-en-welzijn.
11. Universiteit van Amsterdam, *Honoursmodule: Wicked Problems - Lastige veranderingsprocessen*. [cited 2025 March 26]; Available from: https://www.uva.nl/programmas/honoursprogrammas-iis/honoursmodule-wicked-problems/honoursmodule-wicked-problems.html.
12. University of Amsterdam, *Honoursmodule: Wicked Challenges in Health*. [cited 2025 March 26]; Available from: https://www.uva.nl/en/programmes/honours-modules-iis/honoursmodule-wicked-challenges-in-health/honoursmodule-wicked-challenges-in-health.html.
13. Doornebosch, A.J., H.J.A. Smaling, and W.P. Achterberg, *Interprofessional Collaboration in Long-Term Care and Rehabilitation: A Systematic Review.* Journal of the American Medical Directors Association, 2022. 23(5): p. 764-777.e2.
14. Brouwers, M., et al., *An overview of innovative living arrangements within long-term care and their characteristics: a scoping review.* BMC Geriatrics, 2023. 23(1): p. 442.
15. Burgess, J., *Improving dementia care with the Eden Alternative*, in *Nursing Times*. 2025. p. 24-25.
16. Hassink, J., J. Grin, and W. Hulsink, *Multifunctional Agriculture Meets Health Care: Applying the Multi-Level Transition Sciences Perspective to Care Farming in the Netherlands.* Sociologia Ruralis, 2013. 53(2): p. 223-245.
17. de Boer, B., et al., *Green Care Farms as Innovative Nursing Homes, Promoting Activities and Social Interaction for People With Dementia.* J Am Med Dir Assoc, 2017. 18(1): p. 40-46.
18. Browning, M.H.E.M., et al., *An Actual Natural Setting Improves Mood Better Than Its Virtual Counterpart: A Meta-Analysis of Experimental Data.* Frontiers in Psychology, 2020. 11.
19. Goto, S., et al., *The Positive Effects of Viewing Gardens for Persons with Dementia.* J Alzheimers Dis, 2018. 66(4): p. 1705-1720.

20. American Holticultural Therpay Association, *AHTA definitions and positions*. [cited 2025 March 28]; Available from: https://www.ahta.org/ahta-definitions-and-positions.

21. Blake, M. and G. Mitchell, *Horticultural therapy in dementia care: a literature review.* Nurs Stand, 2016. 30(21): p. 41-7.

22. Liu, Y.I. and F.Y. Chu, *Effect of a Horticultural Therapy Program on the Emotional Well-Being of Older Adults With Dementia.* Journal of Research in Education Sciences, 2018. 63(3): p. 257-289.

23. Yun, S.Y. and B.J. Choi, *Effect of Horticultural Therapy on the Stress and Serum Cortisol of Demented Elders.* Korean Journal of Horticultural Science & Technology, 2010. 28(5): p. 891-894.

24. Yang, Y., et al., *Effect of horticultural therapy on apathy in nursing home residents with dementia: a pilot randomized controlled trial.* Aging Ment Health, 2022. 26(4): p. 745-753.

25. Vitman-Schorr, A., et al., *Horticultural therapy impact on people with dementia.* BMC Geriatrics, 2024. 24(1): p. 895.

26. Hansen, M.M., R. Jones, and K. Tocchini, *Shinrin-Yoku (Forest Bathing) and Nature Therapy: A State-of-the-Art Review.* Int J Environ Res Public Health, 2017. 14(8).

27. Heckmann, J.G., M. Kiem, and G. Immich, *Forest Therapy as a Nature-Based Intervention: An Option for Neurological Rehabilitation?* Complement Med Res, 2024. 31(1): p. 56-63.

28. Natuur op Recept, *Natuur op Recept: Wat is het?* [cited 2025 March 28]; Available from: https://www.natuuroprecept.nl/watishet.

29. James Fullam, H.H., Rebecca Lovell, Kerryn Husk, Richard Byng, David Richards, Dan Bloomfield, Sara Warber, Mark Tarrant, Jenny Lloyd, Noreen Orr, Lorna Burns, Ruth Garside *A handbook for Nature on Prescription to promote mental health. Version 1.* . 2021.

30. Nature for Health, *Het Groene GGZ Partnerschap.* [cited 2025 March 28]; Available from: https://www.nahf.nl/het-groene-ggz-partnerschap/.

31. Dundee Green Health Partnership, *Join Scotland's first Green Health Prescribing Programme*. [cited 2025 March 28]; Available from: https://www.greenhealth.scot/prescriber.

32. NHS. *NHS long-term plan*. 2019 [cited 2025 March 28]; Available from: https://www.longtermplan.nhs.uk/publication/nhs-long-term-plan/.

33. Muhl, C., et al., *Establishing internationally accepted conceptual and operational definitions of social prescribing through expert consensus: a Delphi study.* BMJ Open, 2023. 13(7): p. e070184.

34. Di Lorito, C., et al., *What are the challenges that social prescribers face when supporting people within dementia and how can these be addressed? A qualitative study.* PLoS One, 2025. 20(1): p. e0317749.

35. Baker, K. and A. Irving, *Co-producing Approaches to the Management of Dementia through Social Prescribing.* Social Policy & Administration, 2016. 50(3): p. 379-397.

36. Drinkwater, C., J. Wildman, and S. Moffatt, *Social prescribing.* Bmj, 2019. 364: p. l1285.

37. Aspden, T., et al., *Quality-of-life measures for use within care homes: a systematic review of their measurement properties.* Age and Ageing, 2014. 43(5): p. 596-603.

38. Ettema, T.P., et al., *QUALIDEM: development and evaluation of a dementia specific quality of life instrument. Scalability, reliability and internal structure.* Int J Geriatr Psychiatry, 2007. 22(6): p. 549-56.

39. Hughes, L.J., et al., *Psychometric properties and feasibility of use of dementia specific quality of life instruments for use in care settings: a systematic review.* Int Psychogeriatr, 2021. 33(9): p. 917-931.

40. Dam, P.H.v., *Quality of life, care dependency and Paracetamol In advanced Dementia: is paracetamol the panacea to improve quality of life?*, in *Department of Public Health and Primary Care*. 2023, Leiden University Medical Center: http://hdl.handle.net/1887.1/item:3638611.

41. Macháčová, K., et al., *Ratings of activities of daily living in nursing home residents: comparison of self- and proxy ratings with actual performance and the impact of cognitive status.* European Journal of Ageing, 2018. 15(4): p. 349-358.

42. Neumann, P.J., S.S. Araki, and E.M. Gutterman, *The use of proxy respondents in studies of older adults: lessons, challenges, and opportunities.* J Am Geriatr Soc, 2000. 48(12): p. 1646-54.

43. Burks, H.B., et al., *Quality of Life Assessment in Older Adults with Dementia: A Systematic Review.* Dement Geriatr Cogn Disord, 2021. 50(2): p. 103-110.

44. Vink, M.T., and Diesfeldt, H.F.A., *Kritische beschouwing van het concept BPSD.* 2024. 1.

45. Finkel, S.I., et al., *Behavioral and Psychological Signs and Symptoms of Dementia: A Consensus Statement on Current Knowledge and Implications for Research and Treatment.* International Psychogeriatrics, 1996. 8(S3): p. 497-500.

46. Kales, H.C., L.N. Gitlin, and C.G. Lyketsos, *Assessment and management of behavioral and psychological symptoms of dementia.* BMJ : British Medical Journal, 2015. 350.

47. Zuidema, S., M.T. Vink, *Het concept BPSD: goed idee of weg ermee?* Tijdschrift voor Verpleeghuisgeneeskunde, 2003. 26(11): p. 14-16.

48. Warren, A., *BPSD reconsidered: diagnostic considerations to preserve personhood in persons with dementia.* Frontiers in Dementia, 2023. 2.

49. Macaulay, S., *The Broken Lens of BPSD: Why We Need to Rethink the Way We Label the Behavior of People Who Live With Alzheimer Disease.* Journal of the American Medical Directors Association, 2018. 19(2): p. 177-180.

50. Spector, A. and M. Orrell, *Using a biopsychosocial model of dementia as a tool to guide clinical practice.* International Psychogeriatrics, 2010. 22(6): p. 957-965.

51. Dupuis, S.L., E. Wiersma, and L. Loiselle, *Pathologizing behavior: Meanings of behaviors in dementia care.* Journal of Aging Studies, 2012. 26(2): p. 162-173.

52. Goto, S., et al., *The effect of garden designs on mood and heart output in older adults residing in an assisted living facility.* Herd, 2013. 6(2): p. 27-42.

53. Artmann, M., et al., *The role of urban green spaces in care facilities for elderly people across European cities.* Urban Forestry & Urban Greening, 2017. 27: p. 203-213.

54. Liljegren, M., et al., *Introducing the Outdoor Environment as an Arena for Person-Centered Care and Rehabilitation at Residential Care Facilities for Older Adults—A Care Worker's Perspective.* Journal of Aging and Environment: p. 1-17.

55. Groothuijse, J.M., et al., *Active involvement in scientific research of persons living with dementia and long-term care users: a systematic review of existing methods with a specific focus on good practices, facilitators and barriers of involvement.* BMC Geriatrics, 2024. 24(1): p. 324.

56. Morbey, H., et al., *Involving people living with dementia in research: an accessible modified Delphi survey for core outcome set development.* Trials, 2019. 20(1): p. 12.

8

Summary

One in three women and one in seven men will be diagnosed with dementia at some point in their lives. At this moment, more than 55 million people worldwide live with dementia, with nearly 10 million new cases every year.

Dementia is a term for a variety of diseases where a person's thinking abilities gradually decline, making everyday tasks more difficult. As the disease progresses, people living with dementia need increasing support from others, such as help with going outside.

In the Netherlands, about 300.000 people live with dementia, and between 80.000 and 113.000 of them live in nursing homes. Many of these nursing homes were built in the 1960s and 1970s, and still have hospital-like designs: long hallways, locked doors, and limited access to outdoor spaces. Not every nursing home has an outside space, some only have balconies, others a little terrace. None of these old buildings were built to integrate going outside in daily nursing home practice.

In recent years, more attention has been given to the effects of outdoor spaces on people living with dementia. For nursing home residents, the nursing home garden may be their only way to connect with nature. In this thesis, "garden use" refers to any activity in the nursing home garden that matches the resident's preferences and daily routine, such as sitting, walking, or having a meal outside.

Research shows that spending time in a garden can improve quality of life, mood, sleep, social connections, and even physical and cognitive abilities. It seems to help by offering calm, sensory stimulation, and meaningful activities.

Despite these benefits, many nursing home residents do not go outside regularly. About 30% of nursing home residents rarely or never go outside, or only once a month, even though nearly half would like to go out more often.

The overall aim of the studies presented in this thesis was to obtain a better understanding of how garden use can be integrated in daily nursing home practice.

Chapter 2 describes a summary of 17 studies. Overall, these studies appear to suggest positive effects of garden use on quality of life (QoL), behavioral and psychological symptoms of dementia (BPSD), or other outcomes related to QoL or BPSD (stress, sleep, and mood) in people living with dementia in nursing homes.

Chapter 3 shows that about two out of three people living with dementia in nursing homes go outside often, while one out of three rarely or never goes outside. People living with dementia who go outside often tend to receive daily or weekly visits, have a higher positive affect, have less severe physical impairment, do not take

medication for pain, and feel less at home in the nursing home. The severity of physically impairment appears to be the most important factor in determining how often someone goes outside.

Chapter 4 presents the results of a two-week intervention of daily garden use by people living with dementia in an existing green nursing home garden. An increase in positive affect and a decrease in social isolation during the intervention period, and a decrease in negative affect during the follow-up period were observed. Also, most activities that were done during garden use were usual activities in daily nursing home practice, such as sitting, walking and having a beverage.

Chapter 5 describes 'the Vitality Garden' study. In this study the effects of a garden use intervention - incorporating physical, social and organizational environmental components – on garden use, daily life and quality of life of people living with dementia in a nursing home is evaluated. Results showed a slight improvement in garden use directly after the intervention, which declined to baseline levels during follow-up. While using the new garden, people living with dementia spent less time on passive and meaningless activities, and more time on social activities compared to when not using the garden. People living with moderate dementia used the garden significantly more, whereas those with severe dementia used it the least. Lastly, significant QoL improvements were limited to social relations.

Chapter 6 presents the description of the process of development of the 'Nursing Home Garden Toolkit'. The development of this toolkit was part of the Vitality Garden study (**Chapter 5)**, of which one of the components was to design a nursing home garden based on evidence-based practice. The toolkit consists of a) an introduction, b) the foundations, c) the design process, d) a roadmap, e) The Nursing Home Garden Checklist (NHGC), and f) a reference list.

A number of insights emerge from these studies. First, garden use should be a normal part of daily nursing home care, but could also be used as an treatment for problems like anxiety, depression, agitation, or sleep disturbances. Also, special attention should go to people living with dementia who depend most on care.

In addition, caregivers need training to use gardens in everyday routines, and organizations should be able to support these changes. Last, garden use should be part of the nursing home's vision and policy, and the toolkit from Chapter 6 can help with garden design.

Future research should involve people living with dementia more closely and look at how garden use affects their lives over a longer period. More attention should be given to people living with dementia at home, and across diverse cultural contexts.

It is also important to study both how the intervention was developed, executed, and implemented, while also identifying which factors in the local real-world context could be associated with the observed outcomes.

OVERALL CONCLUSION

This thesis shows that spending time in a nursing home garden can have positive effects on quality of life, neuropsychiatric symptoms, and daily life of people living with dementia in nursing homes. Simple everyday activities, like sitting outside, going for a walk, or having a drink, can already make a difference. Not all nursing home residents living with dementia use the garden equally often. Especially those who are most dependent on care due to severe physical impairment or being in a advanced stage of dementia, tend to go outside less frequently.

When developing a garden use intervention to encourage garden use, it is important to consider the physical, social and organizational environment. For the physical environment, this thesis includes a practical 'Nursing Home Garden Toolkit', which can help care organizations with designing gardens that meet the needs of the residents living with dementia, their families, and care staff.

Research that brings together science and practice is essential to make lasting changes. While there is no one-size-fits-all solution, this thesis offers building blocks to help integrate garden use in the daily nursing home practice.

9

Nederlandse samenvatting
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Dankwoord
Curriculum Vitae

NEDERLANDSE SAMENVATTING

Eén op de drie vrouwen en één op de zeven mannen krijgt op een bepaald moment in het leven de diagnose dementie. Op dit moment leven wereldwijd meer dan 55 miljoen mensen met dementie, en daar komen elk jaar bijna 10 miljoen nieuwe gevallen bij.

Dementie is een verzamelnaam voor verschillende ziektes waarbij het denkvermogen van mensen geleidelijk achteruitgaat, waardoor dagelijkse handelingen steeds moeilijker worden. Naarmate de ziekte vordert, hebben mensen met dementie steeds meer hulp van anderen nodig, bijvoorbeeld om naar buiten te kunnen gaan.

In Nederland leven ongeveer 300.000 mensen met dementie, waarvan tussen de 80.000 en 113.000 in een verpleeghuis wonen. Veel verpleeghuizen zijn gebouwd in de jaren 60 en 70 van de vorige eeuw en hebben nog steeds een ziekenhuisachtige inrichting: lange gangen, gesloten deuren en beperkte toegang tot buitenruimtes. Niet elk verpleeghuis heeft een buitenruimte, sommigen hebben alleen een balkon, anderen een klein terras. Deze oude gebouwen zijn niet ontworpen om het naar buiten kunnen gaan een vanzelfsprekend onderdeel te maken van het dagelijks leven.

De afgelopen jaren is er meer aandacht gekomen voor het effect van buiten zijn op mensen met dementie. Voor bewoners van verpleeghuizen is een verpleeghuistuin vaak de enige mogelijkheid om in verbinding te komen met buiten en de natuur. In dit proefschrift verwijst “tuingebruik” naar alle activiteiten in de verpleeghuistuin die aansluiten bij de wensen en dagelijkse routine van bewoners, zoals bijvoorbeeld buiten zitten, wandelen of eten.

Onderzoek laat zien dat tijd doorbrengen in een tuin de kwaliteit van leven, stemming, slaap, sociale contacten en zelfs lichamelijke en cognitieve functies kan verbeteren. Dit komt waarschijnlijk doordat de tuin rust biedt, zintuigen prikkelt en betekenisvolle activiteiten mogelijk maakt.

Toch gaan veel verpleeghuisbewoners niet regelmatig naar buiten. Ongeveer 30% van de verpleeghuisbewoners gaat zelden of nooit naar buiten, of slechts één keer per maand, terwijl bijna de helft juist graag vaker naar buiten zou willen.

Het doel van de studies in dit proefschrift was om beter te begrijpen hoe tuingebruik een plek kan krijgen in het dagelijks leven in het verpleeghuis.

Hoofdstuk 2 geeft een samenvatting van een literatuuronderzoek waarin 17 studies naar tuingebruik door mensen met dementie zijn meegenomen. Over het algemeen laten deze studies positieve effecten zien van tuingebruik op de kwaliteit van leven,

probleemgedrag, en andere factoren die daarmee te maken hebben (zoals stress, slaap en stemming) bij mensen met dementie in verpleeghuizen.

Hoofdstuk 3 laat zien dat ongeveer twee op de drie mensen met dementie in een verpleeghuis regelmatig naar buiten gaan, terwijl één op de drie dat zelden of nooit doet. Mensen die vaker naar buiten gaan, krijgen meestal vaker bezoek, voelen zich positiever, hebben minder lichamelijke beperkingen, gebruiken geen pijnmedicatie en voelen zich minder thuis in het verpleeghuis. Hoe ernstig iemand lichamelijk beperkt is, blijkt de belangrijkste factor te zijn in hoe vaak iemand naar buiten gaat.

Hoofdstuk 4 beschrijft een interventie waarbij mensen met dementie twee weken lang dagelijks gebruikmaakten van een bestaande verpleeghuistuin. Tijdens deze periode werd een toename in positieve gevoelens en een afname in sociale isolatie gezien, en in de weken erna daalde het negatieve gevoel. De meeste activiteiten in de tuin waren gewone dagelijkse bezigheden, zoals zitten, wandelen en iets drinken.

Hoofdstuk 5 gaat over het onderzoek naar 'de Vitale Tuin'. In dit onderzoek werd gekeken naar het effect van een tuininterventie – met aandacht voor de fysieke, sociale en organisatorische omgeving – op tuingebruik, dagelijks leven en kwaliteit van leven van mensen met dementie in een verpleeghuis. Na de interventie nam het tuingebruik licht toe, maar daalde weer naar het oorspronkelijke niveau in de periode erna. Tijdens het gebruik van de nieuwe tuin deden mensen met dementie minder passieve of doelloze activiteiten, en juist meer sociale activiteiten. Mensen met matige dementie maakten het meest gebruik van de tuin, mensen met ernstige dementie het minst. Verbeteringen in kwaliteit van leven werden vooral gezien op het gebied van sociale contacten.

Hoofdstuk 6 beschrijft hoe de 'Toolkit: Hoe ontwerp je een verpleeghuistuin?' tot stand is gekomen. De ontwikkeling van deze toolkit maakte deel uit van de studie 'de Vitale Tuin', waarin een tuin werd ontworpen op basis van wetenschappelijk bewijs. De toolkit bestaat uit: a) een introductie, b) de basis, c) het ontwerpproces, d) een stappenplan, e) de Nursing Home Garden Checklist (NHGC), en f) een literatuurlijst.

Uit de studies in dit proefschrift komen een aantal belangrijke inzichten naar voren. Ten eerste zou tuingebruik een normaal onderdeel moeten zijn van de dagelijkse zorg in verpleeghuizen, maar het kan ook worden ingezet als behandeling voor problemen zoals angst, depressie, onrust of slaapproblemen. Daarbij verdient vooral de groep mensen met dementie die het meest afhankelijk is van zorg extra aandacht.

Daarnaast hebben zorgmedewerkers scholing nodig om tuingebruik in hun dagelijkse werk te kunnen toepassen, en moeten zorgorganisaties in staat zijn om deze veranderingen te ondersteunen. Tuingebruik moet ook onderdeel zijn van

de visie en het beleid van het verpleeghuis. De toolkit uit hoofdstuk 6 kan helpen bij het ontwerpen van een verpleeghuistuin.

Toekomstig onderzoek zou mensen met dementie zelf meer moeten betrekken en kijken naar wat tuingebruik op de langere termijn betekent voor hun leven. Ook is het belangrijk om meer aandacht te hebben voor mensen met dementie die thuis wonen, en voor verschillende culturele achtergronden. Verder is het nodig om niet alleen te kijken naar de resultaten van een interventie, maar ook naar hoe deze precies is ontwikkeld, uitgevoerd en ingevoerd, en welke omstandigheden daarbij een rol spelen.

ALGEMENE CONCLUSIE

Dit proefschrift toont aan dat tuingebruik door mensen met dementie in verpleeghuizen positieve effecten kan hebben op kwaliteit van leven, probleemgedrag, en het dagelijks leven. Gewone dagelijkse bezigheden, zoals buiten zitten, wandelen of iets drinken, dragen al bij aan deze positieve effecten. Niet alle verpleeghuisbewoners met dementie maken evenveel gebruik van de tuin. Vooral mensen die het meest afhankelijk zijn van zorg door ernstige lichamelijke beperkingen, of in een vergevorderd stadium van dementie zitten, gaan minder vaak naar buiten.

Bij het ontwikkelen van een tuininterventie met als doel tuingebruik te verbeteren, is het belangrijk aandacht te hebben voor de fysieke, sociale en organisatorische omgeving. Voor de fysieke omgeving kan de in dit proefschrift beschreven 'Toolkit: Hoe ontwerp je een verpleeghuistuin?' zorgorganisaties ondersteunen bij het ontwerpen van een verpleeghuistuin die aansluit bij de behoeften van de bewoners met dementie, naasten en zorgmedewerkers.

Onderzoek waarin wetenschap en praktijk samen optrekken is noodzakelijk om duurzame veranderingen te realiseren. Hoewel er geen oplossing is die overal werkt, biedt dit proefschrift bouwstenen om tuingebruik te integreren in het dagelijks leven van mensen met dementie die wonen in het verpleeghuis.

BIBLIOGRAPHY

Publications in this thesis

2024 Velde-van Buuringen, M. van der, Verbeek-Oudijk, D., Verbeek, H., Achterberg, W. P., & Caljouw, M. A. A. (2024). Which Characteristics are Associated With Going Outside for People Living With Dementia in Nursing Homes? A Cross-Sectional Study. Journal of Applied Gerontology, 44(7), 1150-1157. https://doi.org/10.1177/07334648241298107

2023 Velde-van Buuringen Mvd, Hendriks-van der Sar R, Verbeek H, Achterberg WP and Caljouw MAA (2023) The effect of garden use on quality of life and behavioral and psychological symptoms of dementia in people living with dementia in nursing homes: a systematic review. Front. Psychiatry 14:1044271. doi: 10.3389/fpsyt.2023.1044271

2021 van der Velde-van Buuringen M, Achterberg WP, Caljouw MAA. Daily garden use and quality of life in persons with advanced dementia living in a nursing home: A feasibility study. Nurs Open. 2021; 8: 1243–1253. https://doi.org/10.1002/nop2.740

Conference contributions

2024 van der Velde-van Buuringen M, Poot C, Verbeek H, Achterberg WP, Caljouw MAA. Co-creating a multicomponent garden use intervention in a nursing home from the perspective of the physical, social and organizational environment. Poster presentation. 27NKG, June 12-14, Stockholm, Sweden.

van der Velde-van Buuringen M, Verbeek H, Achterberg WP, Caljouw MAA. The effect of a multicomponent garden use intervention on garden use, daily life and quality of life of people living with dementia in a nursing home. Poster presentation. 27NKG, June 12-14, Stockholm, Sweden.

van der Velde-van Buuringen M, Beekhuis van der Weijde E, Verbeek H, Achterberg WP, Caljouw MAA. How to design a nursing home garden? An evidence based practice toolkit. Poster presentation. 27NKG, June 12-14, Stockholm, Sweden.

van der Velde-van Buuringen M, Verbeek-Oudijk D, Verbeek H, Achterberg WP, Caljouw MAA. Which characteristics are associated with going outside for people living with dementia in nursing homes? A cross-sectional study. Poster presentation. 27NKG, June 12-14, Stockholm, Sweden.

van der Velde-van Buuringen M, Verbeek H, Achterberg WP, Caljouw MAA. Het effect van een multicomponente interventie op tuingebruik, dagelijks leven en kwaliteit van leven van mensen met dementie in een verpleeghuis. De Vitale tuin. Poster presentation. SANO Wetenschapsdag, October 31, Kerkrade, the Netherlands.

2023 van der Velde-van Buuringen M, Verbeek-Oudijk D, Verbeek H, Achterberg WP, Caljouw MAA. Welke kenmerken van mensen met dementie in het verpleeghuis zijn geassocieerd met naar buiten gaan? Een cross-sectionele studie. Poster presentation. SANO Wetenschapsdag, October 12, Amsterdam, the Netherlands.

2022 van der Velde-van Buuringen M, Hendriks-van der Sar R, Verbeek H, Achterberg WP, Caljouw MAA. De impact van tuingebruik op kwaliteit van leven en onbegrepen gedrag van mensen met dementie in het verpleeghuis: Een systematische review. Poster presentation. SANO Wetenschapsdag, September 22, Leiden, the Netherlands.

Toolkits

2023 van der Velde-van Buuringen M, Beekhuis - van der Weijde E, Verbeek H, Achterberg WP, Caljouw MAA. Hoe ontwerp je een verpleeghuistuin? Een evidence-based practice toolkit. https://unc-zh.nl/wp-content/uploads/2024/05/UNC-ZH-Toolkit%E2%80%93De-Vitale-Tuin-invulbaar.pdf

van der Velde-van Buuringen M, Beekhuis - van der Weijde E, Verbeek H, Achterberg WP, Caljouw MAA. A toolkit for designing a nursing home garden for people living with advanced dementia. https://unc-zh.nl/wp-content/uploads/2024/05/Toolkit%E2%80%93De-Vitale-Tuin-UK-fillable.pdf

Video's

2024 Vitale Tuin – video ervaringen. https://unc-zh.nl/bibliotheek/vitale-tuin-video-ervaringen/

Video Vitale Tuin – Vilans. https://unc-zh.nl/bibliotheek/video-vitale-tuin-vilans/

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CURRICULUM VITAE

Melanie van der Velde – van Buuringen was born on the 16th of November, 1988 in Haarlem, the Netherlands. She obtained her secondary school diploma (Gymnasium) at the Stedelijk Gymnasium in Haarlem. She then studied Psychology at the Vrije Universiteit Amsterdam, where she completed both her Bachelor of Science (2012) and Master of Science (2014) degrees. During her studies, she developed a growing interest in clinical and cognitive neuropsychology, as well as the care for people living with dementia in nursing homes.

After graduating, she worked as a psychologist at Pieter van Foreest, a care organization in the Delft and Westland region. In this role, she provided diagnostics and psychological treatment for people living with dementia and somatic conditions, supported care teams, and contributed to innovation projects aimed at improving quality of life of residents in nursing homes.

In 2019, Melanie began her PhD research at the Department of Public Health and Primary Care of the Leiden University Medical Center (LUMC), within the University Network for the Care sector South-Holland (UNC-ZH). Her research focused on the effect and implementation of garden use in the daily lives of people living with dementia in nursing homes (the Vitality Garden study), working closely with care professionals to bridge science and practice. During her PhD, she also helped train care staff and students, and co-created an evidence-based toolkit for (re) designing nursing home gardens.

Building on her academic and clinical expertise, Melanie co-founded two initiatives: Groene Dag, which promotes the integration of garden use into daily nursing home practice; and BLOOT, which advocates for recognizing intimacy and sexuality as natural and essential aspects of life, including for those living in nursing homes. In February 2025, she became the coordinator of dementia research at Topaz, a care organization in Leiden, where she bridges research and practice by motivating care professionals to actively engage in research. She remains committed to translating research into practical solutions that improve the quality of life for people living with dementia.