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Review Article

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



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A B S T R A C T

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Objective: To examine the impact of gardens and outdoor spaces on the mental and physical well-being of people with dementia who are resident in care homes and understand the views of people with dementia, their carers, and care home staff on the value of gardens and outdoor spaces.

Design: Systematic review.

Methods: Fourteen databases were searched from inception to February 2013. Forward and backward citation chasing of included articles was conducted; 38 relevant organizations were contacted to identify unpublished reports. Titles, abstracts, and full texts were screened independently by 2 reviewers in a 2-stage process and were discussed with a third reviewer where necessary. Results were synthesized narratively.

Results: Seventeen studies were included: 9 quantitative, 7 qualitative, and 1 mixed methods. The quantitative studies were of poor quality but suggested decreased levels of agitation were associated with garden use. The views and experiences of the garden are discussed in relation to themes of how the garden was used, nature of interactions, impact/effect of the gardens, mechanisms/how the garden was thought to have an effect, and negatives (such as perception of the garden as a hazard and the limited staff time).

Conclusion: There are promising impacts on levels of agitation in care home residents with dementia who spend time in a garden. Future research would benefit from a focus on key outcomes measured in comparable ways with a separate focus on what lies behind limited accessibility to gardens within the residential care setting.

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Dementia is a global public health priority, with reports suggesting that each year 7.7 million new cases of dementia are identified.¹ Almost half of the elderly living in residential care have dementia or dementia symptoms, which increases to more than three-quarters in nursing

homes alone (http://www.alzheimers.org.uk/site/scripts/documents_info.php?documentID=341).

There has been increasing interest in the use of nonpharmacological interventions to improve dementia symptoms and the well-being of residents with dementia and their carers.^{2–8}

The availability of gardens or outdoor areas in residential homes may offer a range of benefits for people with dementia, including opportunities for active engagement with gardening, walking in an outdoor environment, and sitting in soothing surroundings.^{9–11} Current guidelines for dementia recommend that specific attention should be paid to the physical environment where people with dementia live, including the design of and access to gardens,¹² indicating that gardens may be a strong element of future care.

There has been no previous attempt to evaluate the evidence of the therapeutic impact of gardens or outdoor spaces for people with dementia who are resident in care homes. We have therefore

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conducted a systematic review of quantitative and qualitative evidence to address the following research questions:

- (1) What is the impact of gardens and outdoor spaces on the mental and physical well-being of people with dementia who are resident in care homes?
- (2) What are the views of people with dementia, their carers, and care home staff on the value of gardens and outdoor spaces?

Methods

The systematic review was conducted following standard guidelines.¹³ The protocol was developed in consultation with experts in old age psychiatry and is registered with PROSPERO (CRD42012003119).

Literature Search and Eligibility Criteria

The search strategy was developed by an information specialist (AB) in consultation with experts, and uses a combination of MeSH and free text terms. The search strategy used in MEDLINE is shown in [Supplementary Appendix A](#) and was translated for use in other databases where necessary. Fourteen databases were searched from inception to February 2013: Medline, Medline In-Process, Embase, PsycINFO, and SPP (OvidSP); AMED, BNI, CINAHL, and HMC (NHS Evidence); ASSIA (ProQuest); CDSR and DARE (Cochrane), Web of Knowledge, and Social Care Online. No date or language restrictions were applied. Forward and backward citation chasing of each included article was conducted. Two of 3 reviewers (AB, RW, or JTC) independently screened titles and abstracts. The full text of articles initially deemed as meeting the inclusion criteria also were independently screened by the same reviewers and discrepancies were discussed and resolved with another reviewer (RG) where necessary.

In addition, 38 relevant organizations were contacted by telephone or e-mail (JTC and AB) and asked to identify unpublished reports ([Supplementary Appendix A](#)). All reports, reference lists, and Web sites arising from these discussions were screened and relevant full texts obtained.

All comparative, quantitative studies of the use of an outside space or garden in a care home for people with dementia reporting at least one of the following outcomes, agitation, number of falls, aggression, physical activity, cognitive functioning, or quality of life, were included.

Qualitative studies that used a recognized method of data collection (eg, focus groups, interviews) and analysis (eg, thematic analysis, grounded theory, framework analysis), and explored the views of people with dementia who were resident in care homes, care home staff, carers, and families on the use of gardens and outdoor spaces were included.

Data Extraction

Data on the study design, population, intervention, outcomes, and results were collected using a bespoke, piloted data extraction form. Data were extracted by 1 of 2 reviewers (BW or JTC) and fully checked by a second reviewer (BW or JTC). Discrepancies were resolved by discussion with a third reviewer (RG).

Risk of Bias

Risk of bias was assessed using the Effective Public Health Practice Project risk of bias tool for quantitative studies¹⁴ and the Wallace criteria for qualitative studies¹⁵ by 1 of 2 reviewers (BW or JTC) and

checked by a second (BW or JTC), and any discrepancies were discussed and resolved involving a third reviewer (RG) if required.

Data Synthesis

The quantitative data were not suitable for meta-analysis, as the study designs lacked appropriate control groups and the data from the 2 comparable randomized controlled trials (RCTs) on the garden intervention would have had limited generalizability. Therefore, the quantitative data were tabulated and summarized narratively. A process of thematic analysis was used to synthesize across the qualitative studies, as they were largely descriptive in nature with little additional interpretation of findings. Data in the form of quotes (first-order concepts) and themes and concepts identified by the study authors (second-order concepts) were extracted. The articles and the extracted data were read and re-read and the findings organized into third-order concepts by the reviewers. We have used participant quotes to illustrate the concepts in the synthesis.

Results

The electronic searches identified 1295 articles of which 85 were retrieved as full text. Seventeen studies met the inclusion criteria (see [Figure 1](#) for reasons for exclusion): 9 quantitative, 7 qualitative, and 1 mixed methods.

Study Characteristics

Fourteen included articles reported on gardens, 3 reported on horticultural therapy, and 1 reported on both interventions¹⁶ ([Supplementary Table 1](#)). The description of the interventions was generally poor in all studies, lacking detail of the garden designs and the nature of resident engagement. One garden was designed with specific characteristics, such as memory boxes, continuous wandering paths, scented but nontoxic plants, and viewing platforms, to enhance the experience of residents with dementia.¹⁷ The remaining gardens were not specifically designed for residents with dementia but contained features such as a mixture of grass, concrete, and decking; raised beds (of flowers or vegetables); gazebos; fish ponds; and benches ([Supplementary Table 2](#)). In some studies, residents were allowed to be in the garden for only approximately 30 minutes per day^{18,19} accompanied by nursing home staff or a researcher, with the doors to the garden otherwise locked. In other studies, residents were allowed to wander unaccompanied^{17,18,20,21} and in some it was unclear if the residents were accompanied or not.^{16,22–27} The components of horticultural therapy varied across the studies in structure, duration, content, frequency, and length of follow-up. Therapy sessions varied from 30 minutes to approximately 1 hour per day, were one-to-one or group based, and were followed-up from 2 to 78 weeks. Sessions involved activities such as seeding, planting and flower arranging, singing, and making jam. Details of the personnel running the sessions were provided in only one study,²⁸ in which a specialized horticultural therapist was involved ([Supplementary Table 2](#)).

Thirteen studies were conducted within the past 10 years; 4 were conducted in the 1990s.^{19–21,29} Most of the studies were conducted in the United States ($n = 8$ ^{18,19,23–25,27,28,30}), 2 were conducted in Australia,^{17,31} 3 in Canada,^{20,21,29} and 1 each in China,³² Sweden,²² Finland,¹⁶ and the United Kingdom.²⁶ The studies involved more than 429 residents with dementia (the total number is not clear as one study recruited 5 units with between 25 and 31 residents in each unit).²¹ More than 72 members of staff and 44 members of family or friends were included in the qualitative studies, again the total number is not clear as one study did not provide this information.¹⁷ The setting was described as a nursing home facility in 9 studies,

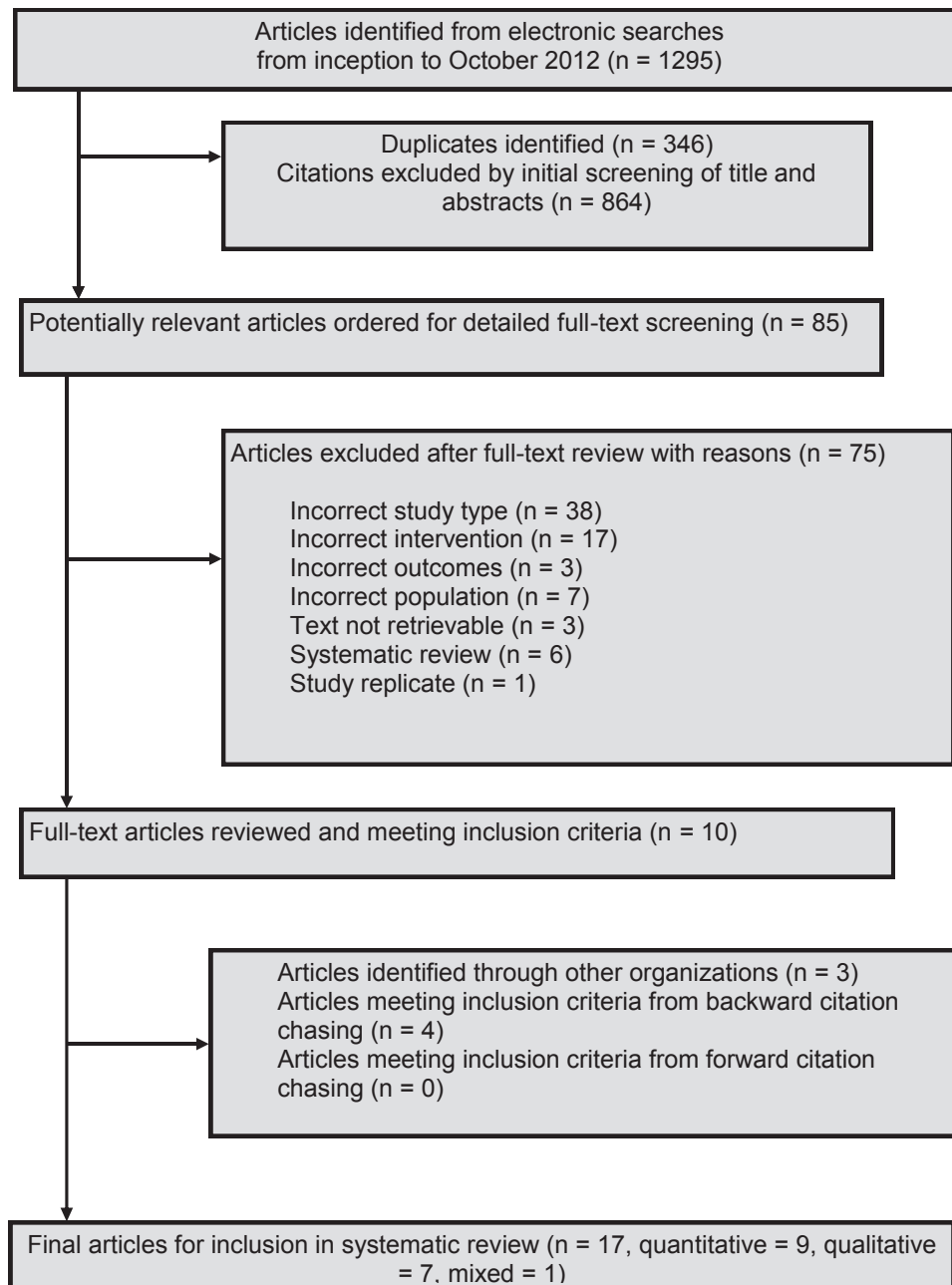


Fig. 1. Screening flow chart.

5 were conducted in specialized dementia care facilities, and 3 were conducted in nursing homes with specialized dementia units.

Study Quality

Of the 10 quantitative studies, 6 were designed as pre-post studies, 2 were RCTs, 1 was a prospective cohort, and 1 was a crossover trial. Most of the studies had a high risk of bias from the lack of blinding involved, but this was largely due to the inability to mask “going into the garden” as an intervention, as residents within one nursing home were randomized to the “control” or “intervention” group. Half of the studies failed to report eligibility criteria or use valid data collection tools. No studies reported power-calculations or compliance with the intervention. Seven of the studies were able to account for all of their participants in their reports (Supplementary Table 3).

Lack of clarity and poor interpretation in 2 studies^{18,19} prevented any detailed description of either study in this review.

All of the qualitative studies had clear research questions, used appropriate study designs, and described results that were clearly substantiated by the data. Most studies also described some form of theoretical stance behind the research question, adequately described how data were collected, and made reasonable claims about generalizability of findings. Most of the studies reflected on outdoor environments as therapeutic in nature, providing an opportunity for multisensory stimulation through reminiscence, social interaction, proving physical and cognitive competence, and improving self-esteem and relaxation. In most of the studies it was not possible to tell if the theoretical perspective had influenced the study design or research findings, nor was it clear if the sample size was adequate or if any potential ethical issues (such as involving people with dementia in

research) had been addressed. In fewer than half of the studies, it was difficult to appraise data collection and analysis quality and little consideration was given to the limitations in study discussions (Supplementary Table 4). In summary, the included studies have been reported poorly and the results are potentially at risk of bias.

Quantitative Synthesis

Seven studies measured the impact of access to a garden on the physical and mental well-being of residents with dementia by using a variety of outcome measures. Sample sizes were small (between 10 and 50), and the results need to be interpreted with caution. Detailed results can be found in Supplementary Appendix B, but these are summarized as follows grouped by outcome and then by intervention (garden or horticulture therapy).

Dementia-related behaviors

Seven studies reported on dementia-related behaviors in response to time in a garden or engaged in horticultural activities. Agitation was reported in 6 studies, and other dementia-related outcomes, such as pacing, exit seeking, and violence, were reported less frequently and with mixed results. Only one study reported a negative trend of increased aggression over a 3-month period.²⁰

Three garden studies measured agitation before and after exposure to a garden environment and all used the Cohen-Mansfield Agitation Inventory (CMAI). All studies reported a positive trend^{18,19,24} with CMAI scores, indicating reduced agitation associated with visiting the garden ($P < .01$); for example, Detweiler and colleagues²⁴ indicate an effect size of $d = 0.64$. Three studies measured dementia-related behaviors before and after horticultural therapy.^{28,30,32} Two studies^{30,32} used an RCT design and report mixed results on the effectiveness of horticultural therapy in reducing physical and nonphysical aggression (also using CMAI). A positive trend was seen in the verbal agitation scores in both studies. Vuolo²⁸ also found a positive trend in the effect of horticultural therapy on physical and verbal aggression and a reduction in physically nonaggressive behaviors in a pre-post study of 50 residents with dementia, but the positive changes were not statistically significant (Supplementary Appendix B).

Pacing or walking behaviors (including exit seeking and trespassing) were measured in 2 studies by observation.^{19,20} Both studies showed a positive trend in reduced pacing, trespassing, and exit seeking, but also a decrease in walking (directed walking), which may be seen as a negative trend. Mooney and Lenore Nicell²¹ compared behaviors in 5 residential sites, 2 of which had gardens and 3 of which did not. Substantial differences between the residential sites with and without gardens were noted, with the rate of violence decreasing by 19% in the garden sites and increasing sevenfold in the nongarden sites over 1 year of observation. Similarly, the total rate of incidents decreased by 3.5% in the garden sites and increased threefold in the nongarden sites over the same period. However, it is difficult to know if these differences relate directly to the impact of the garden or if they are due to other aspects of the individual residential sites.

Emotional outcomes

In 2 studies,^{19,31} emotional outcomes, including pleasure, anxiety, interest, anger, sadness, and contentment, were measured by trained researchers using the Affect Rating Scale.³³ The results across the studies are mixed with little strong evidence for differences in emotional outcomes associated with time spent in a garden or outdoor space (compared with time spent indoors).

Physical outcomes

Three studies assessed the effect of time spent in gardens on physical outcomes, including time spent sleeping and quality of sleep^{18,20} and

physical activity (not walking or pacing).^{19,20} Sleep was measured using a wrist actigraph, whereas physical activity was measured through observations conducted by researchers and, in one study, by using an ambulatory device.¹⁹ Again the results were mixed, and for some outcomes it was unclear if the pre-post change was considered to be an improvement (eg, increased sitting, decreased sleeping, and decreased time looking out of the window).²⁰ One RCT on horticultural therapy reported on sleep quality³⁰ and found that although the quality of sleep (number of wakes, maximum duration of sleep period, and total minutes asleep) did improve, there may be no difference between the intervention and control groups (analysis was pre-post rather than intervention-control) (Supplementary Appendix B). The evidence for risk of falls is mixed, with only 2 studies reporting on this outcome^{21,23} (Supplementary Appendix B).

Medication

One study provided information on medication use.^{23,24} In the first article from this team,²⁴ in which a wander garden was introduced within a dementia unit (with unrestricted access after breakfast until just after dinner), the frequency of medication use in the 34 male residents with dementia was reduced over the 1-year follow-up period. In the follow-up article, a more in-depth analysis found a reduction in the use of secondary antidepressants and antipsychotic medications, but also a significant increase ($P < .001$) in the use of primary antidepressants and anxiolytic medications associated with use of the wander garden. High garden users also were prescribed significantly less secondary antidepressants and antipsychotics than low garden users ($P < .005$ and $P < .001$, respectively). These data indicate that changes in medication prescribing may be associated with spending time in the garden, but because of the pre-post nature of the study design, we cannot rule out the influence of other policy changes that might have occurred at the same time.

Qualitative Synthesis

The 8 studies with qualitative data all explored experiences of garden facilities and 1 study also explored horticultural therapy.¹⁶ We identified no qualitative data relating solely to horticultural therapy; therefore, this qualitative section concentrates on the experiences of gardens only. Seven studies reported on the resident experiences of the garden^{16,22,25–27,29,31}; however, it was often staff and family members who were asked about the residents' experiences on their behalf. In 2 studies, the residents were asked directly about their experiences.^{26,27} In 6 studies, staff and family also were asked about their own experiences of the intervention^{17,25–27,29,31} (Supplementary Table 1).

Five themes were identified that appear to capture the overall experiences of residents, staff, and visitors of the gardens they had access to:

- *Nature of activity*: descriptive information about activities the residents did in the garden (eg, sitting, gardening, writing letters).
- *Interaction*: who or what the residents interacted with in the gardens and how that interaction was affected by being in the garden.
- *Impact*: how the experience of using the garden affected residents, staff, or visitors (eg, quality of life, happiness, contentment, anxiety).
- *Mechanism*: attempts to explore or explain the processes through which the garden may or may not be having an effect.
- *Negatives*: limitations to the intervention or its implementation, such as safety barriers and staff capacity.

Supplementary Appendix C details which studies contributed to each theme.

Nature of activity

Activities included active pursuits, such as walking, playing games, such as golf or baseball, gardening and doing tasks (in the dementia-specific therapeutic garden),^{17,25,31} and passive enjoyment of the surroundings, such as sitting and relaxing, sunbathing, eating, picnicking, looking around the garden, and talking about the trees and flowers.^{25–27} Staff reported that these visits to the garden raised the spirits of the residents and of the staff who accompanied them.

Member of staff – “...We can bring them out here just to relax... It is more fun to come to work as well. They're happier and so are we.” (Edwards et al¹⁷, p. 13, reviewer edit)

Member of staff – “On a nice day like today, we can take them out there to see the flowers and to sit outside and just enjoy them. And then there are a few residents that we know they love flowers. They used to like gardening (before) and used to like growing things and stuff...” (Hernandez²⁵, p. 137, reviewer edit)

In most cases, residents were accompanied into the gardens by staff or visitors:

Member of staff – “... what they normally do there is to go out and have a picnic type of thing. Drinks and ice cream, snacks and that type of thing. And I've seen some family members joining the group. I think this is a very good courtyard.” (Hernandez²⁵, p. 139, reviewer edit)

Very rarely were residents reported to visit gardens of their own accord by themselves or with other residents.

In some cases, residents were reported to be able to continue to garden, when other activities were no longer possible for them:

Family member – “He can't concentrate on anything for very long. So, television is not effective for him because he can't follow the story line. He doesn't read stories or books. These are activities he did before but he's not able to continue them because of the progression of the dementia. But gardening is something that he can still do and enjoy very much.” (Raske²⁷, p. 343, edits in the original)

It is not clear whether the level of engagement affects the level of benefit a resident can gain. Although some authors suggest that as all the residents with dementia in their study improved their agitation irrespective of their level of engagement with the garden, it may be enough to just take in the view of a garden, the smells, and the light.^{17,25}

Interaction

Staff and family members (and some residents) reported that the residents' interaction with the garden seemed to improve their well-being and, in some cases, also improved their interactions with visitors and staff.^{16,17,25,27,29,31} The garden does not just affect the residents but changes the way staff and visitors feel about the care home, as it changes the possibilities for their interaction with residents too. Reports in particular highlighted the way in which interacting with the garden brought the residents “out of themselves” and enabled those around them to interact with them more and see their enjoyment and their personality.

Family member – “There are days when my mom can't even tell me who I am. When she comes out in this garden I see my mom because she lights up. I've had her out front when we had visitors from out of state and she just sits there. But when I bring her out here, she turns her head and is looking at things in the garden. It's different. You can tell she really likes being out here.” (Raske²⁷, p. 344, edits in the original)

In some cases, the garden provided a link to the past, physically (as in the following quotes), but also in terms of a reconnection with

people's previous interests and concerns, or with objects that represented a time before dementia, perhaps giving a sense of normality:

Resident – “I like it all. The fountain, the fish, the memory boxes – everything. The table and chairs in the sunroom came from my lounge room at home, you know. We all sit around it and talk.” (Edwards et al¹⁷, p. 13, edits in the original)

Family member – “Well, mother loves looking out her window at the new tulip tree we planted there for the ‘memory garden.’ She goes outdoors and walks around on a regular basis, but she also spends some time in her room ... and she has a little bit of a view. I got her a little snowman birdfeeder which she asked me for last Christmas when we were at the store shopping. I think it's tacky, but she just loves it, and it brings her such joy to look out at it in the garden. The director said it was OK and I was so glad to do it for her. Now, I'm not sure if she realizes that it's hers today, but she smiles when she sees it and comments on it...” (Hernandez²⁵, p. 132, reviewer edit)

In some cases, interactions with the garden provided structure and purpose as well as pleasure:

Member of staff – “You know, we have flowers, plants outside. And here (in this house), like, Sam ... Some days when he remembers, he says, ‘Oh, it's time now, I want to go take care of my flowers.’ He'll say something like that. And once outside, he'll say, ‘It's time, you know, to water,’ or something like that. He's aware that gardening is part of his life and enjoys it.” (Hernandez²⁵, p. 140, edits in the original)

These excerpts suggest that residents gain a sense of pleasure and connection even from just looking at the garden. This is achieved in a variety of ways but largely from remembrance; that is, a resident remembers he used to be a gardener and so engages in watering the garden, or aspects of the garden bringing fond memories/experiences back to the forefront of their thoughts (again perhaps reflecting a sense of normality and competence). In other ways, the pleasure could be the result of a change of scenery or the relief of being outside rather than restricted to the inside of the residential home.¹⁶ This might be another indication that the garden provided similar degrees of pleasure irrespective of the level of engagement.

In some cases, staff saw the garden as offering a specific therapeutic benefit that staff could access to help residents:

Member of staff – “It calms them to be outside and away from whatever was agitating them. They see something different or feel the breeze against their skin and then they forget why they were upset. They have something else to focus on.” (Hernandez²⁵, p. 135, edits in the original)

Some staff reported greater interaction with the garden themselves. It provided a sense of focus and normality and resulted in experiences with the residents that could be undertaken together, and then further shared as stories. This was particularly acute in one article that reported on the creation of the garden.²⁷

Member of staff – “The staff gets such a kick seeing the residents in the garden. They tell one another stories about residents doing things out in the garden.” (p. 346)

Volunteer – “This whole idea about volunteering to help create the garden. Through these stories and shared walks with residents in the garden, I believe it's the residents who are giving to us.” (p. 346)

Member of staff – “I very rarely, in all the years that I have been here, ever went out there, and now I probably go out two or

three times a day. I can't wait to go out when they start again this spring." (p. 346, *edits in the original*)

It was apparent that the staff also interacted with the garden with the residents and on their own during their breaks. For some staff, this was a new and rewarding experience and it appeared to help them enjoy their work more and encouraged them to use the garden to help residents too.^{25,27}

Impact

Many studies reported on the perceived impact that the gardens had on the residents (and in some cases on the staff as well^{17,25}). This theme sits closely with the quantitative research findings: there were several reports of the gardens reducing the levels of agitation in residents both overall

Member of staff – "We are taking residents from the dementia unit out into the garden in the afternoon and this is preventing them becoming agitated later in the day." (Raske²⁷, p. 344, *edits in the original*)

and for specific incidents:

Member of staff – "Some of them ... when they get agitated and stuff ... you know, you can ask them, 'Would you like to go outside for a little while?' And for some of them it really cools them down. It calms them to be outside and away from whatever was agitating them." (Hernandez²⁵, p. 135, *reviewer edit*)

Some studies reported that the gardens made the residents seem happier:

Member of staff – "We walk them. Well, depending on the weather, we try to walk them at least twice a week around the garden they have out there. Sometimes ... I know in Pod One [Pod One being the highest functioning of the three pods], when the residents come back they're more ... um, happy. You notice a difference in them. You know, it might not be very drastic, but there's something noticed that's different. They're not as they were before they went walking outside." (Hernandez²⁵, p. 138, *edits in the original*)

Member of staff – "Residents are easier to manage, especially if they are sun downing ['Sundowning' is where people with dementia become more confused or agitated later in the day. The cause of this syndrome is unclear but it may be due to reduced levels of light or increased tiredness.³⁴]. We can bring them out here just to relax...They're happier and so are we." (Edwards et al¹⁷, p. 13, *edits in the original*)

Staff in the studies also mentioned other therapeutic benefits, including perceived improvements in quality of life, relaxation, and escapism, as well as the potential to reduce the administration of medications.

Member of staff – "When I take residents out into the garden, especially those from the dementia care unit who don't speak, they make a deep sigh, as if they are at peace." (Raske²⁷, p. 346, *edits in the original*)

Member of staff – "The fact that it (the outdoor space) might help not medicate somebody, that it means putting someone in a better mood when you're not in the mood to eat ... that means feeling better about themselves and eating ... that's pretty beneficial. And you know, you go on and forget your troubles. It takes you outside, it takes you in another dimension of life. There's a real world out there beyond the walls." (Hernandez²⁵, p. 136, *reviewer edit*)

For visitors, the garden provided a normalizing context for their visits, which made them more relaxed and enjoyable:

Family member – "I can't say how much of a difference the garden has made for [name]. Today I have taken her up on the viewing platform and we wrote a letter, she talked about the birds, she loves animals. It's relaxing for us both to be out here. It has definitely improved [name's] quality of life and I enjoy coming more too." (Edwards et al¹⁷, p. 12, *edits in original*)

These extracts focus on the garden and seem to provide further support for the notion of "pleasure" being an underlying benefit, but here too perhaps relaxation plays an important part. The reasons for the perceived impacts are unclear but are partially explored as follows.

Mechanisms

The mechanisms of *how* the gardens really benefited the residents were not discussed in detail. Generally, it was the staff that put forward mechanistic suggestions on how the garden benefited patients. For example, the garden acting as physical and mental therapy where residents could practice behaviors and thought processes they do not get to use inside the residential home.

Social Worker – "I think because gardening *it keeps their senses alive*. Dementia folks cannot learn new things for the most part, unless you are extraordinarily repetitive. But, by any kind of physical therapy, and gardening is one of those, we can help maintain where they are at right now..." (Hernandez²⁵, p. 141, *reviewer edit, emphasis added by reviewers*)

This multisensory engagement is also mentioned previously in relation to Interactions and Impact:

Member of staff – "They see something different or feel the breeze against their skin and then they forget why they were upset." (Hernandez²⁵, p. 135, *reviewer edit*)

Member of staff – "They often come at other times to water the garden or look at the fish, smell the herbs, pick the cherry tomatoes. There is a lot more for them to do." (Edwards et al¹⁷, p. 13, *reviewer edit*)

Social worker – "And the beautiful smells that come from the garden, and color identification that they may forget without the garden. So, I think it's just one part of their therapy, but it's a necessary part in my opinion." (Hernandez²⁵, p. 141, *edits in original*)

Elsewhere, a role for memory and repetition, and connection with life before being in a care home, is suggested, as it keeps the mind more alert and therefore perhaps more able to actively engage with the garden and other people.

Member of staff – "It really depends on the resident. For example [name] spends a lot of time in the tinka car and I think perhaps he liked to drive when he was younger. [name] spends some of every day looking at the memory boxes and talks about parts of her own life that relate to what she sees in the boxes. She says 'I have a teapot like that, you know.' Quite a few of the residents enjoy feeding the birds every day or watering the garden." (Edwards et al¹⁷, p. 13, *edits in original*)

Member of staff – "...And it brings back memories for them. If they were flower people or outdoor people, or had flower gardens ... or garden gardens (vegetables) and so forth. It brings back memories. Many of them it might bring back memories from childhood and they'll talk about it." (Hernandez²⁵, p. 136, *edits in the original*)

The sense of familiarity also highlights the role of memory stimulation in engaging with the garden. Other suggested mechanisms included being able to bring a sense of joy or freedom by being in a safe outside space that might also feel familiar, and others suggest the garden can bring a sense of purpose and ownership:

Resident – “Yes, quiet time, like at break time ... mmm hmm ... I do use the garden for when I’m by myself. You know ... the garden ... in general, garden is life. Garden is ... Is life! I don’t know how to explain (laughs) ... It’s so therapeutic to me. You reflect. You know, it gives you a little time for your meditation, you see ... it is very positive. To give them ... some space. The topography here is very good. Nursing home is kind of ... you know ... confined and institutional ... you see the differences between here and there. Here there is so much more freedom. And the staff has so much more freedom by having a nice large yard to walk around in.” (Hernandez²⁵, p. 140, edits in the original)

Member of staff – “It gives them a sense of purpose and ownership and I also think they enjoy the feeling of looking after the birds and plants instead of being the ones to be looked after all the time; after all most of them were nurturers of some description in their former lives.” (Edwards et al¹⁷, p. 13, edits in original)

Some authors suggest that the garden environments are easy to interact with:

“In green environments, no demanding cognitive appraisals are needed to understand how to act successfully. The environment is easy to interpret even with a diminishing cognitive capability, because it provides abundant information and cues about time, place and purpose, helping orientation toward reality. In addition, green environments provide meaningful activities in which people with dementia are interested in engaging and can consolidate self-esteem.” (Rappe and Topo¹⁶, p. 224, author interpretation)

Negatives

Some studies reported barriers that limited the access residents (and in some cases staff) were able to have to the garden. Concerns about physical safety meant that staff did not always feel able to let residents use the garden as often, or for as long, as they wanted:

Member of staff – “We all have concerns at this point in time about the environment outside – we have nice walkways, nice shrubs, nice trees – with stakes at the moment – and we kind of wondered whether a level ground would have been better, just grass. We’re kind of concerned that they’re walking over the bushes and might trip and fall.” (Morgan and Stewart²⁹, p. 110, edits in the original)

Field note – “Mrs Kuusela with mild dementia is walking in the corridor with a walking aid and asks the caregiver if she could go out for a walk alone. The caregiver: ‘I wouldn’t like you to do it. You can fall. What do you say if we go together tomorrow?’ Mrs Kuusela: ‘It is always the next day ...’ They decided to go outdoors tomorrow afternoon. The caregiver opens the door to the balcony for Mrs Kuusela, which was in the shade. She pops out for some minutes only.” (Rappe and Topo¹⁶, p. 242, reviewer edit)

This may have been particularly the case for newly opened gardens that still had the structural materials of the gardens showing:

“...safety of the outdoor patio area of the new ground floor SCUs was a concern when it first opened. Shrubs, sprinkler systems, stakes and wires supporting new trees and uneven surfaces were identified as potential hazards...” (Morgan and Stewart²⁹, p. 110, author interpretation, reviewer edit)

These restrictions seemed to reflect general care home practices and capacity of staff:

Member of staff – “I do appreciate the fact that they allowed them the freedom to be able to go outside... [but] it creates quite a havoc for us to be watching them when we don’t have

the staff to do that.” (Morgan and Stewart²⁹, p. 110, edits in the original)

The availability of staff to spend one-to-one time assisting residents in the garden in current work settings may be limited; this is highlighted in one study in which the staff-resident ratio was reported to be very poor.¹⁶ Residential homes may be difficult to adequately staff to the extent that visits to the garden are at best assisted and at worst observed; in some homes the garden was not even visible from any inside space.²⁹ As reported here, it is sometimes the case that residents are asking or trying to get out but are not permitted because of a lack of staff or the risk that they may fall.²⁵ In these cases, it appears that staff do want to help, but feel the system does not allow it or that it is not a priority in their caring role.

In one study, the garden was used by staff who were smokers, which made it a less pleasant place for other staff and seemed to prevent some people from using the outside space:

Member of staff – “I usually take my breaks inside. I don’t go outside ... because I’m not a smoker. It’s a nice garden space, so you would think I’d want to go outside, but I don’t, because I don’t smoke. Other employees use it because they go out there to smoke.” (Hernandez²⁵, p. 137, edits in original)

The weather also may have a limiting effect on access. In one study, it was noted that the doors to the garden would be locked if it was deemed too hot for the residents to go outside but that when the weather was cooler and also breezier, this deterred the residents from going outside, so the access to the garden was limited even further.²⁵

Discussion

This systematic review explores both quantitative and qualitative evidence on the impact of gardens for people with dementia in residential care. There is quantitative evidence, albeit from poor-quality studies, of decreased agitation associated with garden use. There was insufficient evidence from quantitative studies to allow generalizability of the findings on other aspects of physical and mental well-being. The evidence for Horticulture Therapy was also inconclusive.

The findings from qualitative studies revealed 5 themes around the views and experiences of the garden from the residents’ and staff and/or family member’s perspective. In general, residents, family, and staff, alike, appreciated the presence of a garden that both allowed for relaxation, and also could stimulate activities and memories. It also provided a normalizing context for interactions with staff and visitors. However, 2 main barriers to the use of a garden included the perception of the garden as a hazard to the residents with a potential for increased risk of falls, and the limited time (if any) staff had to accompany residents outside regularly.^{16,29} The use of the garden as a smoking area by staff also was mentioned as a deterrent.

A wide range of activities occurred in the gardens in the included studies, allowing many residents with dementia to engage with and benefit from the garden at some level. Benefits of the garden were thought to occur through 2 mechanisms: reminiscence and sensory stimulation. The evidence suggests that these mechanisms work partly by encouraging a relaxing and calming environment, while also providing an opportunity to maintain life skills and habits. This is in part supported by other research that suggests that merely viewing nature can reduce stress and anxiety.³⁵ Other studies also have suggested that physical activity may have a role in slowing cognitive decline³⁶ and in reducing falls,³⁷ both of which happen in the garden environment.

Although the review process itself was comprehensive (including extensive searching, contacting organizations, and snowball sampling—where our expert contacts would recommend other relevant expert contacts, and the inclusion of both quantitative and

qualitative evidence), the data and studies included in the review did not allow meta-analyses to be conducted and the picture remains relatively vague regarding the true benefits of the use of gardens for residents with dementia. In particular, the results of this review may be at risk of bias from the low number of RCTs, inconsistencies in study design and data analysis, lack of blinding (of outcomes), small sample sizes, unclear baseline details, and sometimes invalidated data collection tools, all of which limit the power and decrease the reliability and generalizability of the results. The qualitative studies also lacked depth in the data that were collected, represented, and interpreted, leaving further interpretation and synthesis of the findings difficult. Despite this, the main outcome of agitation was measured by the CMAI in all studies reporting on that outcome, and this tool is known to be a valid and reliable measure.³⁸ Dementia research, in general, may benefit from an agreed set of tools to measure common mood and behavior-related outcomes and agreed ways in which to measure more physical/physiological outcomes, such as sleep, physical activity, and falls. Future research also may need to consider what outcomes are the most relevant to measure and how they should be measured and interpreted across studies. In particular, in the evidence synthesized here there was a lack of quality-of-life outcomes and a lack of consistency in the recording of medication use and occurrence of falls. The measurement of quality-of-life issues in people with dementia is a complex issue, but recently a measure based on the standardized European Quality Of Life (EUROQOL) tool³⁹ has been designed specifically for measuring Dementia-related Quality Of Life (DEMQL),⁴⁰ which may assist future research in this area.

From the evidence collected in this review, it is not clear how much of an impact the different residential environments may have had on the outcomes. However, what is clear is the concern and interest around this area, and the necessity for higher-quality research to understand the mechanisms behind interventions and evaluate them.^{10,11} There may be important features about the interactions between staff and residents, and the residents themselves, as well as with the physical environment in specialized dementia units in comparison with homes with a mix of elderly people with and without dementia. Equally, the features of the garden (eg, a general yard versus a landscaped garden versus a dementia-specific garden) also may have an impact on the level of benefit residents with dementia may gain. There is a glut of literature that has looked at the design of gardens specialized for the elderly and for those with dementia⁴¹ but the recommendations appear as yet to be unused in the research literature. All these aspects will be important to consider in future research for them to be explored in future syntheses.

The measurement of medication usage or prescribing often was not recorded in these studies, but consistent reporting of this across studies would help us to understand if the effectiveness of the garden in residents' mood and behavior is also reflected in the use of medications for those residents. Outcomes related to falls also were infrequently and inconsistently measured despite these outcomes being particularly important in informing the balance of benefits and harms of allowing access to gardens for residents with dementia. These issues should be considered in future research in this area.

Another key issue that future research must address is the accessibility of the gardens for the residents either alone or accompanied. The studies in this review reported a range of access from residents being able to go out in the gardens at any time after breakfast and before dinner (accompanied or not)²⁴ to only being able to go outside if accompanied by a family member or a member of staff (who often did not have time or were reluctant to assist residents in the garden) and otherwise the doors would be locked.¹⁶ More exploration of the reasons behind limiting access would be useful to understand where barriers to garden accessibility are really

initiated. For example, do limitations in staff capacity (or other aspects of the residential care home system) legitimately restrict residents' access to gardens, or is it about staff knowledge or attitudes to care, or is it about resident safety? Understanding how these systems and processes work will enable best practice to be identified and implemented.

Conclusion

There are promising impacts on levels of agitation in care home residents with dementia to spend time in a garden, although the topic is currently understudied and undervalued. Interpretation of the findings further suggest that gardens need to offer a range of ways of interacting, to suit different people's preferences and needs. Future research also would benefit from a focus on key outcomes measured in comparable ways with a separate focus on what lies behind limited accessibility to gardens within the residential care setting. Developing knowledge and understanding in these areas will help to further improve appropriate care experiences and inform policy more accurately.

Supplementary Data

Supplementary data related to this article can be found online at <http://dx.doi.org/10.1016/j.jamda.2014.05.013>.

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