



**COMMENTARY**

## Remembering Your Roots: The Role of Horticulture Therapy in People Living with Dementia

Kelly Reilly Kroustos, PharmD, CDP<sup>1</sup>; Gretchen Horning, PharmD<sup>1</sup>; Jennifer Gurevich, PharmD<sup>1</sup>; Anna Gurevich, (PharmD candidate 2021)<sup>1</sup>; Kristen Finley Sobota, PharmD, BCPS, BGCP<sup>1</sup>

<sup>1</sup>Raabe College of Pharmacy, Ohio Northern University, Ada, OH

Corresponding Author: Kelly Reilly Kroustos, 525 South Main Street, Ada, OH 45810, (419) 772-3955, [k-reilly@onu.edu](mailto:k-reilly@onu.edu)

Submitted September 13, 2019 Accepted May 10, 2020

### ABSTRACT

**Introduction:** Dementia is a debilitating disease affecting over 50 million people. Major challenges facing patients with dementia lie in the impact of the behavioral and psychological symptoms of dementia (BPSD). The American Geriatrics Society and Dementia Action Alliance recommend against the use of antipsychotics as first-line treatment. Antipsychotics often fail to treat BPSD whereas nonmedication practices such as horticulture therapy may lessen BPSD. Guideline evidence has provided a unique opportunity for public health officials to assist in filling this vital role in the approach to BPSD management.

**Methods:** Several studies and meta-analyses were reviewed to determine the effectiveness of horticulture therapy in managing BPSD, and evidence supports horticulture therapy as an effective method of addressing BPSD.

**Results:** The benefits of horticulture therapy extend beyond addressing only BPSD; through multisensory stimulation, patients have increased physical activity, reduced stress, and improved sleep. Horticulture therapy has been shown to decrease the sense of loss and reestablish the patient in a familiar nurturing role, providing the patient with a sense of purpose.

**Conclusion:** Stakeholders within the public health sector are strategically positioned to implement evidence-based interventions that address the unmet needs for the care of dementia within the community.

**Keywords:** Dementia; BPSD; Horticulture; Gardening therapy; Nonmedication

### Current Perspectives on Dementia

Dementia is a debilitating and progressive disease affecting over 50 million people globally, with an estimated US financial impact of \$818 billion in 2015 health care costs.<sup>1</sup> In alignment with Healthy People 2020 and the topic area of dementia, the overarching goal is to reduce morbidity, improve the quality of life, and address cost-related barriers to care in people living with dementia and Alzheimer's disease.<sup>2</sup> Within the state of Ohio, Alzheimer's dementia is the sixth leading cause of death, impacting 220 000 seniors (> 65 years of age) with a projected 30 000 senior increase in the next 5 years.<sup>3</sup> A reported 600 000 family caregivers bear the responsibility for direct care and/or health decisions for their loved ones.<sup>3</sup> The Ohio Medicaid program pays approximately \$2.5 billion per year in caring for people with Alzheimer's dementia.<sup>3</sup> "These numbers show that a public health approach is necessary

to lessen the burden and enhance the quality of life for those living with cognitive impairment and their families."<sup>3</sup>

The American Academy of Neurology dementia guidelines classify dementia-related decline into various overlapping realms of impairment that include cognitive, behavioral, and functional.<sup>4</sup> The cognitive domain of dementia includes language and social skill, memory, learning, attention, and perception.<sup>5</sup> Individuals exhibiting deficits within the social domain of dementia often have stark changes in personality and behavior.<sup>5</sup> These are collectively referred to as behavioral and psychological symptoms of dementia (BPSD) and include agitation, aggression, depression, delusions, and hallucinations due to frustration, pain, and the inability to communicate unmet needs.<sup>5-7</sup> Changes in functional capacity should be assessed using validated methods during medical visits as guidelines support the use of rehabilitation and therapy ser-



vices.<sup>8</sup> Due to the detrimental effects of dementia, people often require medical, emotional, and socially supportive interventions.

### Approach to Care

Dementia management goals are to preserve independence, stabilize and delay further loss of cognitive and functional ability, and improve quality of life.<sup>9,10</sup> First-line medication management for mild to moderate dementia is monotherapy with an acetylcholinesterase inhibitor: donepezil, rivastigmine, or galantamine. For moderate to severe dementia, memantine may be used in combination with the acetylcholinesterase inhibitor.<sup>4,11</sup>

Management strategies for BPSD often include unlabeled use of antipsychotics; however, research indicates that antipsychotics fail to show benefits when compared with placebo, leading to more adverse events.<sup>7,12,13</sup> Both the American Geriatrics Society and the Dementia Action Alliance indicate that nonmedication therapies are first-line interventions for individuals with BPSD. The Food and Drug Administration issued a black box warning for the use of antipsychotics in people with dementia due to heightened risk of mortality and adverse events.<sup>13</sup> Further restrictions on the utilization of antipsychotics within the dementia population were implemented through the Centers for Medicare and Medicaid Services (CMS) with the National Partnership to Improve Dementia Care. While antipsychotic utilization nationally has decreased to 23.9% in 2011, CMS announced an additional reduction of 15% by the end of 2019.<sup>14</sup> These benchmarks directly relate to the Five-Star Quality Rating System and highlight the partnership's larger mission of enhancing the use of nonmedication strategies in person-centered dementia care practices.<sup>15</sup>

Implementation of person-centered strategies has been recognized by the Alzheimer's Association as the "single most important determinant of quality dementia care across all care settings is direct care staff." Increasing numbers of people with dementia will necessitate the need for both family caregivers as well as long-term care providers. The need for paid care providers will continue to increase from 3.27 million in 2014 to 4.56 million in 2024.<sup>16</sup> Guideline evidence and subsequent CMS mandates have provided a unique opportunity for public health officials to engage local aging sectors to assist in filling this vital role in the approach to BPSD management. Creating a network within area agencies on aging, councils on aging, senior centers and senior housing developments can help to support the resources needed for family caregivers in home and community-based settings. While institutional care settings are charged to meet current CMS regulations, implementation of individualized nonmedication strategies may be challenging because of current staffing responsibilities. Collaboration with the previously mentioned aging sectors as well as external community stakeholders (church groups, philanthropic groups, and students from high school and/or college programs) would provide an opportunity for volunteers to contribute to the management of BPSD.

Nonmedication strategies provide a targeted approach to addressing BPSD and potentially lighten caregiver burden.<sup>9</sup> Current nonmedication approaches include cognitive, reminiscence, multisensory, and stimulation therapies.<sup>11</sup> Cognitive therapy encompasses activities like reading books and doing puzzles to help maintain cognitive function.<sup>17</sup> Options for effective therapy include aromatherapy, massage, touch therapy, music therapy, pet therapy, and multisensory stimulation (MSS).<sup>18</sup> Multisensory stimulation uses everyday objects to engage or arouse 4 of the 5 senses (acoustic, tactile, olfactory, visual) with the goal of evoking positive feelings.<sup>18</sup> Lastly, there are stimulation therapies like cooking and social robots that provide people with a sense of purpose and recollections of the past.<sup>19,20</sup> Newly emergent is horticulture therapy which combines sensory, reminiscence, and stimulation therapy,<sup>9</sup> and allows individuals to partake in gardening which, among other benefits, provides a sense of purpose and improves quality of life.<sup>10</sup>

Health care providers within the public health sector are uniquely positioned to assist in the care of people with dementia and address caregiver burdens through evidence-based intervention. Various health-centered professionals or caregivers can implement first-line therapies for BPSD including nonmedication practices such as horticulture therapy. The versatility of who may deliver these nonmedication practices is proved by the fact that they are not limited to those within the health care setting.

### Horticulture Therapy

Horticulture therapy is used to describe the health benefits of therapeutic gardening, including reduction in BPSD, improvement in circadian rhythm, and an increasing muscle strength.<sup>10,21,22</sup> Recently, horticulture therapy has been identified in literature and practice as beneficial for people with dementia. Therapeutic gardens are primarily described as wander or sensory gardens. Wander gardens allow individuals to walk uninhibited to alleviate restlessness, a common symptom associated with dementia. Thus, individuals who suffer from restlessness wander in a safe, secure, and enclosed environment. Sensory gardens cater to all 5 senses and allow people to enjoy fresh air and nature. The gardens are designed with safety in mind, often including high walls and simple arrangements.<sup>10</sup>

There are 2 main uses of sensory gardens, active and passive. Active use includes purposeful activities of gardening, including watering, planting, and weeding. Passive use refers to the sensory experience of seeing, touching, and smelling the garden as well as being in the fresh air and sunshine of outdoors. Both types of gardens have shown benefit in people living with dementia.<sup>10</sup>

### Health Benefits

Horticulture therapy has been noted to improve cognitive symptoms in individuals with moderate dementia.<sup>21,22</sup> D'Andrea et al implemented horticulture therapy in study participants with



Alzheimer's disease at a long-term care facility. Twenty out of 40 participants with dementia attended 45-minute horticulture therapy sessions twice weekly for 12 weeks. The remaining 20 participants served as the control group, partaking in all other recreational events except horticulture. With the assistance of a therapeutic recreation specialist, participants planted seeds and later tended and watered the plants. Using observation, medical records, and 2 scoring systems, Minimum Data Set Plus (MDS+) and Test for Severe Impairment (TSI), researchers assessed psychosocial and cognitive changes from baseline. The MDS+ is a comprehensive quarterly assessment that is used to evaluate all areas of a residents' physical, social, and emotional well-being and was used to identify problem areas and document behavior changes. The TSI is an objective and valid means of assessing the cognitive and psychosocial functioning of persons and is divided into 6 sections valued at a maximum of 4 points per section with a maximum TSI score of 24 reflecting high cognition. The 6 sections cover 1) well-learned motor performance, 2) language comprehension, 3) language production, 4) immediate/delayed memory, 5) general knowledge, and 6) conceptualization. D'Andrea et al concluded horticulture is associated with reduction in feelings of helplessness, enhanced decision making, stimulated interest in socialization, and alleviation of lack of concentration and memory loss. Study findings also reflect positive outcomes for the MDS+ assessments within the intervention group as compared to the control group. Statistically significant differences ( $P < 0.0005$ ) were identified between the control and the intervention group TSI difference scores (mean difference scores = 2.8 points) regarding cognitive functioning.<sup>23</sup>

Lee et al studied the effect of indoor gardening on sleep, agitation, and cognition in 23 institutionalized study participants presenting with BPSD.<sup>21</sup> Edible dropwort and bean sprouts were chosen for the garden as they were familiar plants, grew quickly, and were edible. Every morning and afternoon during the 4-week study, participants tended to their plants with the assistance of nurses. Along with gardening, participants were encouraged to touch or look at their plants outside of the cultivating sessions. Once plants reached full height, they were harvested and were used as a side dish in their meals. As a result, participants not only shared in the gardening process, but also tasted the fruits of their efforts. The findings of Lee et al suggest improvements in sleep measured by wake time after sleep onset (WASO), time during naps, nocturnal sleep time (NST), and nocturnal sleep efficacy percent ( $NSE\% = NST/WASO \times 100$ ). Pre-horticulture intervention WASO duration was 75.2 ( $\pm 34.9$ ) minutes while post-horticulture intervention resulted in WASO duration of 54.75 ( $\pm 26.6$ ) minutes ( $P < 0.05$ ). Time spent napping decreased from 158.43 ( $\pm 63.64$ ) minutes pre-horticulture therapy to 85.87 ( $\pm 43.97$ ) minutes ( $P < 0.05$ ) post-horticulture therapy. Once horticulture therapy was implemented, NST went from 440.5 ( $\pm 59.2$ ) minutes to 483.5 ( $\pm 56.6$ ) minutes ( $P < 0.05$ ) and NSE showed an increase from 85.09% ( $\pm 6.98$ ) to 89.62% ( $\pm 5.27$ ) ( $P < 0.05$ ), respectively. A decrease in WASO and duration of naps, with an increase in NSE

and NST indicates less fragmented sleep which may lead to a decrease in agitation. Further study is required to conclude that gardening improves cognition; however, the results suggest that providing sensory stimulation through gardening leads to a decrease in agitation and aggression.<sup>10,21,22</sup>

An observational study conducted by Murphy et al collected baseline data for 12 months on 34 veterans residing in a memory unit.<sup>22</sup> The facility opened an outdoor wander garden for residents and observed the impact on agitation. Twenty-one participants were able to walk unassisted, and the others used merry walkers or wheelchairs. Outcomes observed included the change in the Cohen-Mansfield Agitation Inventory (CMAI) short form, which is an established validated tool for measuring agitation in institutionalized patients and consists of 14 items with a 5-point rating scale with a maximum score of 70 points (1= patient never engages in the behavior to 5 = behavior occurs several times per hour). The CMAI short form used in the current study includes a variety of dementia-related behaviors. For the first 2 months, the average CMAI score decreased (21.38-18.85) then plateaued (18.9) for 2 months, then increased (18.97-19.67) during the winter months when the wander garden was unavailable and by the end of the study period decreased (18.9) once again. Even with the CMAI increases during the winter months, the increase in score never equaled the original CMAI score. These findings suggest wander gardens promote a decline in agitation and mirror the findings from the meta-analysis of Gonzalez et al (see **Table 1**).<sup>10,22</sup>

## Conclusion

Statistics from the Ohio Alzheimer's Associations clearly demonstrate future needs surrounding the care of people with dementia.<sup>3</sup> A unified public health approach is necessary to maintain person-centered care, lessen caregiver burden, and support the needs of the community. Recent evidence recognizes horticulture therapy and outdoor wander gardens as an alternative method of addressing BPSD with health benefits. Behavioral and psychological symptoms of dementia include agitation, aggression, and depression due to the inability to communicate unmet needs.<sup>5-7</sup> Horticulture therapy is associated with a reduction in feelings of helplessness and agitation, while promoting sleep, decision making, socialization, and concentration.<sup>10,23</sup> Public health advocates in collaboration with aging sectors have an integral role in introducing the concept of horticulture therapy to caregivers and long-term care providers as an option for BPSD management. By harnessing the healing and restorative effects of nature, improving quality of life, and instilling a community-like environment, horticulture therapy promises a bright future for people living with dementia.

The authors deny any conflicts of interest.

## ACKNOWLEDGMENTS

Ohio Northern University American Society of Consultant Pharmacists Student Chapter, Vancrest of Ada, Martha Mazak, RPh



Table 1. Summary of Selected Studies on Horticulture Therapy in Individuals with Dementia

| Authors                      | Subjects and study design  | Population studied             | Implementation of therapy   | Trial length            | Outcome measures  | Results  |
|------------------------------|--|--------------------------------|---|-------------------------|---|--|
| Lee et al <sup>21</sup>      | One group repeated measures study<br>n=23  | Dementia                       | Indoor garden: each individual planted a pot with dropwort and bean sprouts to care for daily | 5 weeks                 | Sleep patterns, agitation and cognition evaluated using the modified CMAI and revised HDS | Sleep, agitation, and cognition improved ( $P < 0.05$ )                                    |
| D'Andrea et al <sup>23</sup> | RCT<br>n=40  | AD                             | Participants randomized into the treatment group attended biweekly horticulture               | 12 weeks                | MDS+, TSI used to evaluate cognitive levels and functioning                               | Overall functional levels improved ( $P < 0.0005$ )  |
| Gonzalez et al <sup>10</sup> | Meta-analysis<br>16 studies<br>n=549;<br>interventions with pre- and post-tests, RCT | Dementia and AD                | Sensory garden benefits, therapeutic horticulture benefits                                    | Trials varied in length | Measures of behavioral and psychological therapy, including well-being and sleep patterns | Improved well-being, sleep, behavioral problems; decreased falls and use of antipsychotics |
| Murphy et al <sup>22</sup>   | Observational study<br>n= 34   | Veterans in secure memory unit | Wander garden   | 12 months               | CMAI score  | CMAI decreased during the first 2 months ( $P < 0.001$ )                                   |

Abbreviations: CMAI = Cohen-Mansfield Agitation Inventory, used to measure frequency and severity of aggressive behaviors; HDS= Hasegawa Dementia Scale; MDS+= Minimum Data Set Plus; TSI= Test for Severe Impairment; AD= Alzheimer's disease; RCT= Randomized controlled trial

## REFERENCES

- World Health Organization. Dementia. Published December 2017. Accessed March 6, 2018. <https://www.who.int/news-room/fact-sheets/detail/dementia>
- Healthy People 2020. Office of Disease Prevention and Health Promotion. Dementia, Including Alzheimer's Disease. Updated September 6, 2019. Accessed March 6, 2018. <https://www.healthypeople.gov/2020/topics-objectives/topic/dementias-including-alzheimers-disease>
- Alzheimer's Association-Ohio. Alzheimer's Impact Association. Updated February 28, 2020. Accessed March 6, 2018. <https://www.alz.org/professionals/public-health/state-overview>
- McKhann GM, Knopman DS, Chertkow H, et al. The diagnosis of dementia due to Alzheimer's disease: Recommendations from the National Institute on Aging-Alzheimer's Association workgroups on diagnostic guidelines for Alzheimer's disease. *Alzheimers Dement*. 2011;7: 263-69.
- Hugo J, Ganguli M. Dementia and cognitive impairment: epidemiology, diagnosis, and treatment. *Clin Geriatr Med*. 2014 Aug; 30(3):421-442. doi:10.1016/j.cger.2014.04.001
- Cerejeira J, Lagarto L, Mukaetova-Ladinska EB. Behavioral and psychological symptoms of dementia. *Front Neurol*. 2012 May 7; 3:73. doi:10.3389/fneur.2012.00073
- Kroustos KR, Trautwein H, Kerns R, Sobota KF. Fidget Blankets: A Sensory Stimulation Outreach Program. *Consult Pharm*. 2016; 31(6):320-324. doi:10.4140/TCP.n.2016.320
- Dementia assessment: management and support for people living with dementia and their carers. *NICE*. 2018; 97. Accessed March 6, 2018. <https://www.nice.org.uk/guidance/ng97>
- InformedHealth.org. Cologne, Germany: Institute for Quality and Efficiency in Health Care (IQWiG); 2006-. Non-drug interventions for Alzheimer's disease. 2013. Updated June 29, 2017. Accessed March 6, 2018. <https://www.ncbi.nlm.nih.gov/books/NBK279355/>
- Gonzalez MT, Kirkevold M. Benefits of sensory garden and horticultural activities in dementia care: a modified scoping review. *J Clin Nurs*. 2014 Oct; 23:2698-2715. doi:10.1111/jocn.12388
- American Psychiatric Association. Practice Guidelines for the Treatment of Patients with Alzheimer's Disease and Other Dementias. Accessed January 31, 2019. [http://psychiatryonline.org/pb/assets/raw/sitewide/practice\\_guidelines/guidelines/alzheimers.pdf](http://psychiatryonline.org/pb/assets/raw/sitewide/practice_guidelines/guidelines/alzheimers.pdf)
- Gitlin LN, Kales HC, Lyketsos CG. Managing Behavioral Symptoms in Dementia Using Nonpharmacologic Approaches: An Overview. *JAMA*. 2012;308(19):2020-2029. doi:10.1001/jama.2012.36918
- Steinberg M, Lyketsos CG. Atypical antipsychotic use in patients with dementia: managing safety concerns. *Am J Psychiatry*. 2012;169(9):900-906. doi:10.1176/appi.ajp.2012.12030342
- National Partnership to Improve Dementia Care in Nursing Homes: Antipsychotic Medication Use Data Report. Centers for Medicare & Medicaid Services. Accessed: May 23, 2020. <https://www.cms.gov/Medicare/Provider-Enrollment-and-Certification/SurveyCertificationGenInfo/National-Partnership-to-Improve-Dementia-Care-in-Nursing-Homes>



15. Larrick AK. Request Comments: Enhancements to the 2017 Star Ratings and Beyond. 2015 Nov. Accessed March 3, 2019. <https://www.cms.gov/Medicare/Prescription-Drug-Coverage/PrescriptionDrugCovGenIn/Downloads/2017-Star-Ratings-Request-for-Comments.pdf>
16. Gilster SD, Boltz M, Dalessandro JL. Long-Term Care Workforce Issues: Practice Principles for Quality Dementia Care. *Gerontologist*. 2018;58 (suppl\_1):S103-S113. doi:10.1093/geront/gnx174
17. Carrion C, Folkvord F, Anastasiadou D, Aymerich M. Cognitive Therapy for Dementia Patients: A Systematic Review. *Dement Geriatr Cogn Disord*. 2018; 46(1-2):1–26. doi:10.1159/000490851
18. Witucki JM, Twibell RS. The effect of sensory stimulation activities on the psychological well-being patients with advanced Alzheimer's disease. *Am J Alzheimers Dis Other Demen*. 1997;12:10-5.
19. Valentí Soler M, Agüera-Ortiz L, Olazarán Rodríguez J, et al. Social robots in advanced dementia. *Front Aging Neurosci*. 2015;7:133. doi:10.3389/fnagi.2015.00133
20. Fitzsimmons S, Buettner L. A therapeutic cooking program for older adults with dementia: Effects on agitation and apathy. *Am J Recreat Ther*. 2003;23-33.
21. Lee Y, Kim S. Effects of Indoor Gardening on Sleep, Agitation, and Cognition in Dementia Patients – A Pilot Study. *Int J Geriatr Psychiatry*. 2008;23(5):485–489. doi:10.1002/gps.1920
22. 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 (3):355-373. doi:10.1177/1471301210375336
23. D'Andrea SJ, Batavia, M, Sasson N. Effect of horticultural therapy on preventing the decline of mental abilities of patients with Alzheimer's type dementia. *J Ther Hortic*. 2007;18:8-17.

© Kelly Reilly Kroustos, PharmD, CDP; Gretchen Horning, PharmD; Jennifer Gurevich, PharmD; Anna Gurevich, (PharmD candidate 2021); Kristen Finley Sobota, PharmD, BCPS, BGCP Originally published in the Ohio Journal of Public Health (<https://ohioph.org/ojph/>) June 2020. This is an open access article distributed under the terms of the Creative Commons Attribution Non-Commercial No-Derivatives License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work ("first published in the Ohio Journal of Public Health...") is properly cited with original URL and bibliographic citation information. The complete bibliographic information, a link to the original publication on <https://ohioph.org/ojph/>, as well as this copyright and license information must be included.