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The Psychosocial Impacts of Co-Designed Healing Gardens Among Aged Care Residents With and Without Dementia in Nigeria

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ABSTRACT

Healing gardens are green spaces that support the interaction of humans and elements of nature to improve well-being and quality of life. However, little is known about healing garden use and outcomes in African countries. This study aimed to design a healing garden intervention and measure its impact on psychosocial factors and quality of life of residents and care staff within two residential aged care facilities in Lagos, Nigeria. Each facility's staff completed the psychosocial measurement tools by proxy for participants between ages 60 and 99, with or without dementia, at baseline and three months following interaction with the garden and completed the garden use observational survey to determine the effect on and use of the garden by care staff and residents. Results revealed an improvement in the quality of life and experiences of agitation but no beneficial change in depression among residents with and without dementia. Further, care staff reported a positive benefit of the garden on their work-life experience and the residents' well-being. This study provides the base for future research on assessing the impact of healing gardens on persons living with dementia in Africa.

Abbreviations: DEMQOL: Dementia Quality of Life Instrument; CSDD: Cornell Scale for Depression in Dementia; CMAI: Cohen-Mansfield Agitation Inventory; QOL: Quality of life; GuO: Garden Use Observational Questionnaire; LMIC: Low- and medium-income countrySI Unit: ft²: Square feet

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co-design; green space; healing garden; occupational health; older adults; quality of life

According to a recent meta-analysis, the global prevalence of cognitive impairment amongst older adults living in residential aged-care facilities is over 20% (Chen et al., 2023). In low- and middle-income countries, about 63% of older people live with cognitive impairment and dementia (Maestre, 2012). The population of Nigerians aged 60 years and above was

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estimated to have almost doubled from 5 million in 1995 to 9.5 million in 2015 (United Nations, 2019) thus predicting a progressive rise in the number of dementia cases in Nigeria (Adeloye et al., 2019). Studies in Nigeria have reported an estimated prevalence of 11.8-18.4% and 2.9% for cognitive impairment and dementia, respectively (Mavrodaris et al., 2013; Ogunniyi et al., 2016). A study conducted at a geriatric clinic in Nigeria showed a 59.4% prevalence of cognitive impairment in older people between 65 and 74 years old (Anieto et al., 2023).

The knowledge and resources to diagnose and treat dementia are limited within this demography (Maestre, 2012). In Nigeria and other sub-Saharan African countries, socioeconomic inequalities hinder Alzheimer's disease diagnosis, as well as limited access to diagnostics, therapies, and screening tools (Kerwin et al., 2022). The socio-cultural stigma associated with traditional beliefs that link unusual behavior with witchcraft accusations is widely reported as a challenge to dementia diagnosis (Chen et al., 2023). Additionally, pharmacological treatments for people living with dementia are shrouded with uncertainties around their cost and benefits (Synnott et al., 2021) with negligible effects on cognition and high side effects being reported (Grossberg et al., 2019). With the absence of a current cure for dementia, there is a need to explore approaches that maintain and improve the quality of life of people living with dementia. In recent years, non-pharmacological interventions have witnessed a rise in supporting the well-being and improving the quality of life of persons living with dementia.

Healing gardens

Evidence supports the use of nature-based activities such as gardening to improve the well-being and quality of life of older adults, including those living with dementia (Sia et al., 2020) within residential care (Barrett et al., 2019; Edwards et al., 2013). Healing gardens are nature-based interventions that have positively impacted human well-being (Detweiler et al., 2012). They have existed since the Middle Ages when they were placed next to monastery hospitals to provide the sick with a peaceful escape from the world (Jiang, 2014). Since healing gardens are described as a "plant-dominated environment, designed as a retreat and a place of respite" (Diehl, 2010) and engaging in meaningful activities (occupation) is a vital aspect of non-pharmacological intervention that helps to maintain function (Miller & Butin, 2000), healing gardens may provide an avenue for gardening as occupational therapy (Pozzi et al., 2023; Wiseman & Sadlo, 2015).

Healing gardens can fulfill a fundamental human need to connect to the natural world (Mayer et al., 2009), especially in care setting such as aged care residences. Ulrich (2001) suggested that gardens in healthcare

settings are essential stress-mitigating resources for patients and staff because they foster social support, a sense of control, physical movement, and exercise. A review of outdoor gardening activities in the hospital and residential care facilities for persons with dementia reported improvement in social participation and connection, mood, agitation, light exposure, sleep, attention, memory, self-identity, and pain reduction (Detweiler et al., 2008; Liao et al., 2020; Ng et al., 2023).

In low- and medium-income countries such as Nigeria, one study suggests a strong positive correlation between the quality of a garden's components and the user's overall quality of life (Fadamiro & Adedeji, 2015). However, there is still a lack of evidence of the outcomes of gardening among older persons in Nigeria. A recent review by Shuvo et al. into urban green space and health in LMICs concluded that the inquiry into the potential health benefits of green space in LMICs is an important gap in knowledge (Shuvo et al., 2020). Also, there is the inference that exposure to nature-based environments is essentially beneficial and will naturally give rise to occupational activities for persons living with dementia (Zeisel et al., 2020). A recent review showed that there is scarce evidence of the occupations of people with dementia within outdoor spaces, such as gardens in hospitals and residential care facilities (Ng et al., 2023). Thus, the main aim of this study is to develop a co-designed healing garden in two residential aged care facilities in Lagos, Nigeria and measure its impact on depression, agitation and quality of life among residents with and without dementia as well as the general impact of the garden on their care staff.

Method

Design

The design was a pre- and post-test of surveys administered and completed by each primary care staff (within the facility) before the garden development and three months after setting up the gardens (i.e. between March 31 to June 30, 2023).

Setting

Two residential aged care facilities, Marian Akintola Senior Citizen Care Home, Abule Egba (Facility 1), and Elderly Care Home, Maryland (Facility 2) within Lagos state, Nigeria, were selected by convenience sampling. The selected residential aged care facilities met the following criteria: (a) privately managed and provided assisted daily living (possible support to meet one's physical needs in eating, dressing, bathing, toileting, continence, and mobility) (Edemekong et al., 2019) to older people, (b) the absence

of an existing garden, (c) the availability of a potential site to locate a garden of a minimum of 21.5-32.2 square foot (ft²) area, (d) the willingness of the facility management and care staff to participate in the study.

With support from the facility management, the study team recruited older people and care staff. Older people were recruited and selected if they could perform minimal physical activities with their hands and were willing to participate. The care staff (i.e. nurses and trained social caregivers) participated and provided support for the older people during the project. The term facilities will be used to refer to residential aged care facilities hereafter.

Participants

This study recruited 33 older individuals ranging from age 60 to 99 years, resident in either of both facilities, who were able and willing to participate. Most participants were clinically diagnosed with dementia. In addition, fourteen care staff, who had worked 6 months and over in the individual facilities were recruited.

Procedure

The study commenced with the co-design and development of individual healing gardens over three months in the two facilities.

Using a co-design approach, the garden was sited and developed on the available outdoor area within each facility (measuring 64.5 ft² and 32 ft² for Facilities 1 and 2, respectively). Initially, a site assessment was conducted within the facility to determine the location and basic design of the garden. To ensure a co-design participatory approach to the design of the garden, stakeholders of each facility management and care staff contributed to the site assessment process and completed a needs assessment survey. The site assessment involved onsite observation of both facilities' surroundings and historical data inquiry. Suitable sites for each garden were identified and agreed upon in collaboration with the facility management. Given the limited availability of the outdoor floor area in both facilities, some outdoor amenities within the facilities were relocated. Both floor areas that accommodated the laundry lines in Facility 1 (see [Plate 1](#)) and Facility 2-floor area, which accommodated the facility power generator, waste drum, and cooking gas cylinder (see [Plate 3](#)), were identified and existing amenities were relocated. Additionally, part of the garden development activities included the implementation of a rodent/pest control plan as well as the development of a natural lawn *via* modification of the original concrete floor of the garden area, (see [Plates 2 and 4](#)). Both residents and care staff contributed to the gardening process by sowing seeds and transplanting plant nurseries.



Plate 1. Garden site before garden installation at facility 1. **Plate 2.** Developed garden at facility 1.



Plate 3. Garden site before garden installation at facility 2. **Plate 4.** Developed garden at facility 2.

The needs assessment results comprised management and care staff knowledge, experience with healing gardens, and their preferred garden features incorporated into the design and development. Details of the needs assessment outcome are reported elsewhere (Akindejoye & Achor, 2023).

Both gardens utilized locally fabricated garden features and vertical garden designs that incorporated sensory stimulating elements of nature. These elements included scented and colorful plants, flowers with different textures displayed in artistically painted plant vases, as well as edible vegetables like pumpkin leaves (Ugwu), Nigerian spinach, and Jute (Ewedu). Additional details about the artistic paintings of the plant vases can be found elsewhere (Nogueira Haas et al., 2024).

Other garden features include movable outdoor patio (4-seater) seats with overhead canopy (stationed to avoid swings and falls), installed natural lawn (on a previously concrete floor), meshed metal pergola, concrete seat and planter fixture, plant vases, concrete lawn slabs, and concrete paving slabs (for wheelchair access). A mesh-like pergola was adopted to form a roof over the garden, allowing sun rays and providing shade by creeping plants within the mesh. In addition, vertical frames were utilized to maximize the available garden area, which occupies less surface area (see [Plates 2 and 3](#)). An important outcome of the initial needs assessment, which contributed to the garden co-design approach, was the naming of the garden. After deliberations between the facility management and care staff, the garden in Facility 1 was named “Dorcas Eden” and that of Facility 2 was named “Trinity Garden”.

All outcome measurement tools were completed by the participant’s care staff, who were trained to rate these surveys. This evaluation approach follows the methodology of a similar study by Edwards et al. (2013). In addition, an online *Garden Use Observational Questionnaire (GuOQ)* (Marcus & Barnes, 1995) was included as a secondary measurement.

Outcome measures

The Dementia Quality of Life Instrument. (DEMQOL proxy) (Smith et al., 2005), consists of 31 items, is a proxy report of the quality of life of persons living with dementia completed by the care staff (scores range from 31 to 124, with a higher score indicating better quality of life). It can measure the quality of life in mild, moderate, or severe dementia. The DEMQOL-Proxy shows competent acceptability, good internal consistency (Cronbach’s $\alpha=0.87-0.92$) and reasonable evidence of validity in people with mild/moderate and severe dementia (Alzheimer, 2022).

The *Cohen-Mansfield Agitation Inventory(CMAI)* (Cohen-Mansfield et al., 2012) is a care staff rating questionnaire consisting of 29 agitated behaviors, each rated on a 7-point scale of the frequency with which they manifest physically aggressive, physically non-aggressive, and verbally agitated behavior with “1” meaning “never” and “7” meaning “several times per hour” over two weeks preceding the assessment. A total score can be obtained by summing all items from 29 to 203. Where a score of >45 is considered clinically significant agitation. The CMAI has shown good internal consistency and validity (Finkel et al., 1992).

The *Cornell Scale for Depression in Dementia* (CSDD) is a clinical test used to determine the symptoms and signs of depression in people living with dementia. Observation of the patient and an interview with the patient and their care staff are used to score the CSDD. The questionnaire has five sections: mood-related signs, behavioral disturbance, physical signs, cyclic functions, and ideational disturbance. It consists of 19 questions,

with each response scored from 0, where the symptom is absent, to 2, where the symptom is severe. Scores above 10 indicate a probable major depression. Scores above 18 indicate a definite major depression. Scores below 6 as a rule are associated with the absence of significant depressive symptoms (Alexopoulos, 2002). The CSDD has a sensitivity and specificity of 93% and 97% at a cutoff value of ≥ 6 and it has been shown to be valid in populations with or without dementia (Kørner et al., 2006).

Garden Use Observational Questionnaire (GuOQ): The GuOQ was designed to record the observed traffic flow, user activities, user type and possible benefits of healing gardens (Marcus and Barnes 1995). For this study, the questionnaire was adapted and administered online for care staff to report their observations on the frequency and duration of garden visitation and garden activities by residents & care staff after the garden was developed. The online GuO questionnaire also explored residents and care staff frequency and duration of garden visits and activities. Also observed feelings and mood change after garden visits and what they like about the garden.

Data analysis

A descriptive analysis was conducted on participants' demographic data. The quantitative data were analyzed using a paired student *t*-test on Excel. The *p* value < 0.05 , confidence intervals of 95% and Cohen's *d* effect size were used to determine for statistical significance. A descriptive narration was conducted on the Garden Use Observational Questionnaire.

Results

Participants

Participants comprised of 33 older individuals: 19 females and 14 males between 60 and 99 years old (average age: 76.75 ± 10.9). Most participants ($n = 20$, 60%; 12 females and 8 males) were clinically diagnosed with dementia. The individual stages of dementia diagnosis were not reported. And fourteen (6 females and 8 males) participating care staff between ages 23 to 50 years across the two residential aged care facilities.

Psychosocial outcomes of participating residents

The total number of participants that completed the three outcome measures differed due to missing data. Table 1 shows the outcomes of the participants' quality of life, agitation, and depression average scores at baseline and post-intervention. The result indicates that the intervention had a statistically significant effect on improving participant's quality of life and agitation outcomes. And a statistically significant effect with no beneficial change in their depression outcome (See Figures 1–3).

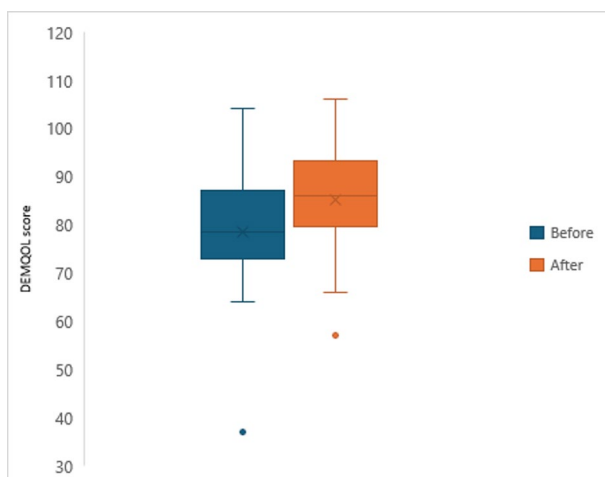


Figure 1. Baseline And three-months post dementia quality of life Instrument survey of all participants.

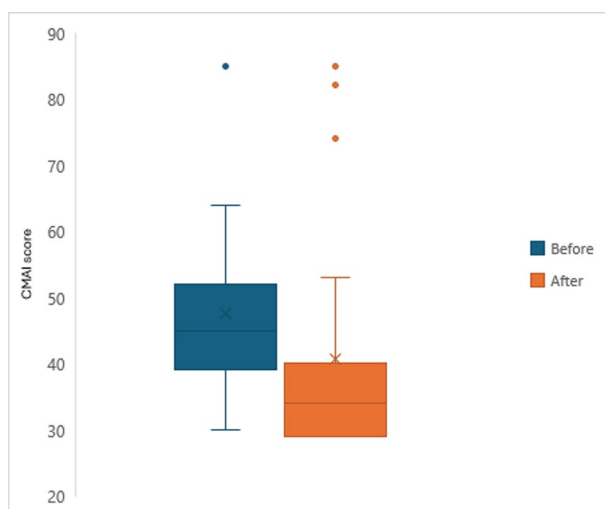


Figure 2. Baseline And three-months post Cohen-Mansfield agitation Inventory survey of all participants.

Analysis of the completed surveys from participants living with dementia showed a statistically significant effect with no beneficial change in depression outcome. While their quality of life and agitation outcomes were not statistically significant (Table 2).

Quantitative outcomes on garden use

Fourteen care staff ($n=14$) completed the online GuOQ, post the garden development. Table 3 shows a parallel between the frequency of garden visitation and duration of time spent by the residents and care staff. This

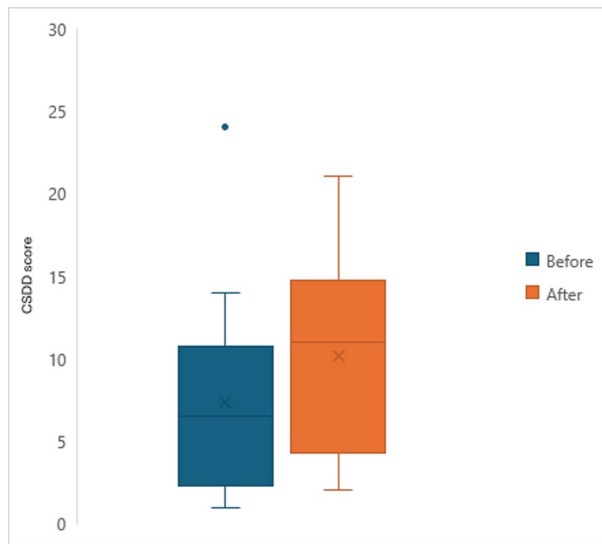


Figure 3. Baseline And three-months post Cornell scale for depression in dementia survey of all participants.

Table 1. Mean outcome scores for all participants at baseline and three months post-intervention.

Outcome measure	Persons with dementia %	Baseline Mean SD	Post-intervention Mean SD	<i>p</i> -value	Effect size
Dementia Quality of Life Instrument (<i>n</i> = 22)	59%	78.5 (14.4)	85.1 (11.4)	0.047	−0.5
Cohen-Mansfield Agitation Inventory (<i>n</i> = 23)	65%	47.6 (14.3)	40.7 (17.0)	0.010	0.43
Cornell Scale for Depression in Dementia (<i>n</i> = 20)	65%	7.35 (5.5)	10.15 (6.0)	0.002	−0.9

Note: *n*: number of participants that completed the survey; Higher post DEMQOL score: better outcome; Lower post CMAI & CSDD score: better outcome

Table 2. Mean outcome scores for participants with dementia at baseline and three months post-intervention.

Outcome measure	Baseline Mean (SD)	Post-intervention Mean (SD)	<i>p</i> -value	Effect size
Dementia Quality of Life Instrument (<i>n</i> = 13)	78.7 (11.2)	84.7 (13.3)	0.112	−0.5
Cohen-Mansfield Agitation Inventory (<i>n</i> = 15)	49.8 (17.1)	44.6 (20.0)	0.157	0.2
Cornell Scale for Depression in Dementia (<i>n</i> = 13)	8.5 (3.7)	10.6 (4.2)	0.029	−0.5

Note: *n*: number of participants that completed the survey; DEMQOL: Dementia Quality of Life Instrument; CMAI: Cohen-Mansfield Agitation Inventory; CSDD: Cornell Scale for Depression in Dementia; ES: Cohen's D effect size; CI: Confidence interval. Higher post DEMQOL score: better outcome; Lower post CMAI & CSDD score: better outcome.

parallel and accurate recording may arise from the fact that the residents accessed the garden under the care or supervision of staff. Care staff reported that most residents spend between 10-30 min (*n* = 10). While care

Table 3. Garden use report by residents and care staff via care staff observation.

Questions	<i>n</i> = 14
Number of care staff who reported residents' duration of visit to garden	
Less than 10 min	5
10-30 min	5
More than 30 min	4
Percent of care staff who reported residents' activities during garden visit	
Relax	12
Walk through	2
Number of care staff, who visited the garden at varying intervals	
Several times a day	2
Every day	7
Once/twice a week	5
Number of care staff, reported duration of stay during garden visit	
Less than 10 minutes	3
10-30 min	9
More than 30 min	2
Number of care staff using garden for various activities	
Visit with a patient	1
Walk through	2
outdoor therapy	2
Relax	8
Eat	1
Number of respondents reporting various types of mood change	
More relaxed, less stressed	8
Refreshed, rejuvenated	4
Spiritual connection	1
Pleased, more positive	1
Number of care staff who named these garden feature as helpful in attaining mood change	
Flowers and greenery	9
Arts on plant vases	4
Others	1
Number of care staff who reported various rate of residents visit to garden	
Several times a day	2
Every day	6
Once/twice a week	5
no response	1

staff reported that themselves generally visit the garden every day ($n=7$) and spend between 10-30 min ($n=9$). The garden was mostly accessed by care staff ($n=8$) and residents ($n=12$) for relaxation purposes. The garden flowers were liked best by most staff and for which most of the staff reported being more relaxed, less stressed, calmer and contented following a visit to the garden. Moreover, the flowers, colors, and greenery were identified as the qualities of the garden that changed the mood of most staff. Most care staff ($n=8$) reported feeling More relaxed, less stressed when in the garden.

Discussion

The study examined the impact of a co-designed healing garden on psychosocial measures and quality of life of residents with or without dementia and their primary care staff in two residential aged care facilities in Lagos state, Nigeria. Following the healing garden use, participants (residents with or with dementia) showed statistically significant improvement in

quality of life and agitation outcomes but no beneficial change in depression outcome. These results support the positive benefits of healing gardens among older persons with dementia. The quality-of-life score increased by 8%, which is comparable to a 10% increase in the quality of life in persons living with dementia using a similar intervention in a study by Edwards et al., (2013) and supports other studies that have linked enhanced quality of life to opportunities for social (Odzakovic et al., 2020) and physical activities (Huang et al., 2020) during nature-based activities. Additionally, it aligns with improved quality of life in a study that employed other forms of occupational therapy among persons with mild cognitive impairment (MCI) and early stages of dementia after a three-months follow-up after baseline (Coe et al., 2019).

The amount of agitation was also significantly reduced (by 14%) among our participants after the first three months of the intervention. This result is in line with similar studies (Detweiler et al., 2009; Detweiler et al., 2008; Ford Murphy et al., 2010), which revealed that the more the individuals visited the garden, the less agitated they were. This significant decrease in agitation is consistent with the results from a systematic review (Whear et al., 2014) in which authors concluded that people living with dementia who pass time in a garden space feel lower levels of agitation.

In terms of depression, our study revealed a significant increase (28%) in depression outcome among all participants (residents with and without dementia). This is in contrast to only a 13% decrease in depression scores in the study by Edwards et al., (2013). This might be explained by the duration of residing in the facilities, in that recent persons admitted into the facilities, may be characterized by loneliness and loss of independence, having an impact on mood. Also, residents might be experiencing depression owing to biological factors such as disruption of the hypothalamic-pituitary-adrenal axis, immune activation and vitamin deficiencies in late life (Tiemeier, 2003). Another plausible reason could be due to perceived internalized stigma of living in a care home, as reported in a study that explored associated factors of depressive symptoms in aged care homes (Tosangwarn et al., 2018). Similarly, a feasibility study that hypothesized that an occupational therapy program would reduce depression severity in aged care residents recorded no effect on resident's depression (Mozley et al., 2007).

Concerning the care staff's experience, they affirmed that visiting the garden creates an avenue for stress relief and a feel-good feeling; "The garden makes me better and stress-free, especially when stressed out. I go to the garden to have some feel, and in the process, I become better than I was before." "With the garden installed here in our Home, MASC Care Home, I experience less stress in my daily activities." "It is gratifying for me to plant, tend, harvest, and share my food. Activities like this

provide structure to my day and are linked to improving my mental, social, and spiritual health.” Besides the greenery of the garden, the artistic paintings on the plant vases were highlighted as one of the garden features that elicited positive feelings and admiration among the care staff; “The artistic paintings on the plant vases are very beautiful, and it makes me feel happy whenever I visit the garden.”

These comments and attitudes are similar to findings in Jonveaux et al., (2013); Art, Memory and Life Garden project. In this project, they found that art, together with other elements of nature in garden spaces, can promote the recollection of one’s life memories and the pleasure of storytelling and reminiscing. Moreover, selectively placed works of art can arouse positive emotions throughout the year and offer a symbol of longevity (Jonveaux et al., 2013). Jonveaux et al, study also revealed that communication between care staff and residents improved while visiting the garden together (Jonveaux et al., 2013), just as our care staff stated that they and their clients spend more time outdoors visiting the garden to relax, eliciting feelings of refreshment, relaxation, and spiritual connection. Moreover, our care staff reported that they mostly spend time in the garden to relax, walk, eat, and engage in outdoor therapy, aligned with the findings from similar studies (Edwards et al., 2013; Ng et al., 2023; Jonveaux et al., 2013).

Based on the use of a co-design approach where facility management, care staff, and residents were involved in the garden design decisions and development process, we believe it fostered increased engagement with the garden as a result of genuine project ownership. Our belief is deduced from the positive feedback and active participation of residents, facility care staff, and management. This is further evident in the naming of the gardens “Dorcas Eden” (named after the founder of the facility) and “Trinity Garden”(named after religious beliefs—the Trinity). The chosen names indicate personal association and emotional investment, indicating a sense of ownership and a deep connection to the garden. This collective engagement is aligned with findings from a systematic review by Nguyen et al. (2024) on co-design methods of green spaces. In their review, they suggested that co-design methods have the potential to increase public engagement and help develop green spaces that satisfy the needs of communities. Overall, the introduction of the garden idea, its associated artistic and gardening activities elicited much excitement and expectation among residents and care staff and, consequently, positive changes among participants.

Application to practice

This study revealed that gardening or simply visiting a garden can be an effective and practical occupational intervention in promoting quality of

life and reducing agitation among aged care residents. Moreover, gardening as an occupational intervention strategy provides care staff and care partners alike options for practical experiences together with people living with dementia, which can reduce hindrances to daily functioning and improve the physical fitness and health of residents (Miller & Butin, 2000).

In addition, the study results revealed that both care staff and residents spent time outdoors in the garden following its installation. This is considered an avenue for addressing outdoor deprivation as an emerging aspect of occupational therapy (Firby & Raine, 2023). Furthermore, access to and time spent in nature have been linked to higher levels of connection to nature (Barrable & Booth, 2020; Chawla, 2020). Connection to nature is beneficial as it promotes quality of life (Edwards et al., 2013; Sia et al., 2020), improves social connection, identity, self-esteem, emotional health and independence (Bennett et al., 2022; Han et al., 2016) among others.

Care staff who participated in this study reported a positive mood change including spiritual connection. Supporting spiritual well-being is a significant aspect of the occupational therapy approach, especially for clients experiencing neurodegenerative disease like dementia. When occupational therapist or health care providers use gardening experiences to support clients' spiritual connection, such support should be person-centered, acknowledging their individual preferences (Unruh et al., 2000).

Limitations

A major limitation is the small sample size and number of incomplete assessments, leading to compromised analytical power. There is a need for a larger-scale study, ideally with a control group, to establish more robust evidence. Moreover, the study did not consider the garden design and the type and stage of dementia. Also, this study did not control several possible confounders, such as visits by residents' loved ones or the increased interaction between residents, care staff, and garden developers during the garden development process. It can be argued that the increase in the influx of external visitors (including garden construction workers and project team members) may have promoted increased interaction within the facility. Also, the study did not include visiting family members who may have used the garden with their loved ones.

Conclusion

To the best of our knowledge, this study is among the first to develop and test the benefits of a healing garden for residents with and without

dementia in an aged care residents setting in Lagos, Nigeria, and adds to the evidence on the health benefits of healing gardens among persons with dementia in West Africa. Specifically, the study shows that healing gardens and related art and gardening activities can improve the quality of life and agitation of older aged care residents with and without dementia. However, in addressing depression, priority should be placed on reducing perceived internalized stigma (Tosangwarn et al., 2018; Underwood et al., 2013).

In summary, our findings add to the growing body of evidence that shows the psychosocial benefits of gardening for aged care residents, including those with dementia (Uwajeh et al., 2019). However, a systematic review also highlighted that studies remain sparse and that there is a shortage of knowledge, specifically regarding the type and severity of dementia and garden design principles (Murrioni et al., 2021).

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Authors' contributions

FA conceptualized and implemented the study, collected, and cleaned data, and analyzed the data. FA developed the first draft. EU reviewed the first draft and developed the introduction. SR reviewed the second draft and partly wrote the discussion and conclusion.

Ethical approval

An application for full ethical approval was made to the Lagos University Teaching Hospital and Health Research Ethics Committee. The ethics approval number is ADM/DSCST/HREC/APP/5600. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed consent

Written informed consent was obtained from all care staff and legal guardians involved in the study. To further ensure that participants' data confidentiality was maintained, participants' personal information was removed and anonymized (using codes) to protect participants' identities. A written informed consent was obtained

Disclosure statement

No potential conflict of interest was reported by the author(s).

Disclaimer

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Data availability statement

Raw data were generated at MASC Care Home and Elderly Care Home, Maryland. Data supporting this study's findings are available from the corresponding author, FA, upon request. Data files, and **supplemental data** are openly available on the project's Open Science Framework page.

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