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Review Article

Provision of Outdoor Nature-Based Activity for Older People with Cognitive Impairment: A Scoping Review from the ENLIVEN Project

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The health and well-being benefits of outdoor nature-based activity are increasingly recognised, but older people with cognitive impairment face significant barriers to access. The ENLIVEN project aims to promote access by gathering evidence and coproducing guidance for activity providers. As part of this project, we conducted a scoping review to characterise the types of outdoor nature-based activity for older people with dementia and other forms of cognitive impairment for which research evidence is available and the range of outcomes is examined. The protocol is available online. We systematically searched relevant databases from 1st January, 2009, to 20th October, 2022, and screened articles against the following criteria: participants were older people aged 65 and above with cognitive impairment arising from dementia or another health condition. The study described the formal provision of outdoor nature-based activity away from the person's usual place of residence, and at least one outcome of participation in the activity was evaluated. Twenty-eight articles met inclusion criteria, all focused on people with dementia. In most cases, participants were attending day care or living in residential care, and sample sizes ranged from 4 to 136. Activities fell into three groups: green day care (fifteen articles), equine-assisted interventions (seven articles), and community nature-based activities (six articles). Outcome domains explored were connection with nature, activity engagement, impacts on clinical symptoms, functional ability, physical, psychological and social health,, and quality of life. Outdoor nature-based activity can be offered as an opportunity for meaningful occupation to enrich daily life, as a framework for day care provision, or as an intervention to address clinical needs. The evidence base for green day care is relatively established, but the potential for addressing specific clinical needs remains to be explored. The paucity of evidence regarding community provision, especially for those not attending formal care settings, suggests the need for effective knowledge exchange to stimulate initiatives in this area.

1. Introduction

There are 771 million people aged 65 years or over worldwide, and this is projected to rise to 1.6 billion by 2050 [1]. Globally, more than 55 million people live with dementia, a number expected to rise to over 150 million by 2050 [2]. Between 5 and 10% of people over 65 in higher-income countries live with dementia, with prevalence doubling every 5 years after the age of 65 [3]. Cognitive impairment can also arise due to other age-associated neurological conditions such as stroke or Parkinson's disease [4]. Living with cognitive impairment has implications for well-being, with

many experiencing poor quality of life [5]. This is often not a direct result of the health condition itself but rather results from secondary consequences that could potentially be alleviated, such as loneliness, social isolation, and lack of meaningful occupation [6]. Community-based initiatives that enable people to engage in activities and connect socially in ways that accord with their interests and preferences are important for maintaining quality of life; this includes support to get out and about, take exercise, and enjoy the natural environment [7].

The health and well-being benefits of engaging with nature and the outdoor environment for people with a range of health conditions are increasingly acknowledged [8–11], and this extends to older people with dementia and cognitive impairment [12, 13] and their family caregivers [14, 15]. Suggested benefits of outdoor activity for people with dementia include providing pleasure and enjoyment, maintaining independence and meaningful occupation, promoting social inclusion, stimulating memory and the senses, and enhancing identity and self-esteem [13, 16]. In support of this, greater perceived availability of local green and blue spaces was associated with better quality of life among a large cohort of people with mild-to-moderate dementia [17]. It is important to ensure that people who wish to do so can continue to connect with the natural environment, take exercise, and engage in individual or group activities that they enjoy. This could be in familiar everyday spaces or could involve visiting places further afield [18]. However, older people with dementia and other forms of cognitive impairment experience significant barriers to accessing the natural environment, with some excluded entirely [19–23], especially those from minority ethnic and disadvantaged groups and those living in long-term residential care [18]. Older people with cognitive impairment may be concerned about staying safe, falling, or getting lost, and caregivers may judge it too risky to take the person they care for outdoors, but many barriers are social and structural, relating, for example, to facilities, physical accessibility, signage, transport, and costs [19, 20, 22, 24]. Addressing barriers to accessing outdoor nature-based activity requires us to consider both how to enable individuals and families to engage and how to develop supportive social and organisational attitudes and practices among those who manage and control access to outdoor green and blue spaces, provide the nature-based activities that take place within those outdoor spaces, or provide the care settings in which people spend time [25, 26].

The ENLIVEN project—Extending active life for older people with cognitive impairment and their families through innovation in the visitor economy of the natural environment—was set up as part of the UK Healthy Ageing Challenge Social, Behavioural, and Design Research programme https://www.ukri.org/what-we-offer/our-main-funds/industrial-strategy-challenge-fund/ageing-society/) to gather evidence and co-produce resources and guidance for providers offering or wishing to offer outdoor nature-based activities for older people with dementia and other forms of cognitive impairment. For the purposes of the project, outdoor nature-based activity was defined as "an activity undertaken outdoors in green or blue spaces such as parks, gardens, farms, woodlands, rivers, and beaches in which being in, attending to, or engaging with aspects of the natural environment, including animals where relevant, is a key component." A first step was to assess the available evidence about the kinds of initiatives that have been implemented and tested and the routes through which these might confer benefits. There have been previous reviews focused on garden use and horticultural activities for people with dementia [16, 27] and on mechanisms of benefit of nature-based activity [13, 28], but we found no wide-ranging review covering the provision of any type of nature-based activity for older people with dementia or for older people with other forms of cognitive impairment. To address this gap, given the broad focus, we identified a scoping review [29] as the most suitable approach. To our knowledge, this is the first scoping review to examine the available research evidence about the provision of all types of outdoor nature-based activity for older people with dementia or other forms of cognitive impairment. The aims of the review were as follows:

(1) To identify and characterise the types of outdoor nature-based activity provision for older people with dementia and other forms of cognitive impairment that have been the subject of research and for which research evidence is available

(2) To identify and describe the range of outcomes examined in the research studies on this topic

2. Methods

This scoping review was conducted in accordance with available guidance [30, 31] and with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA-SR) Statement [32]. The PRISMA checklist is available in Supplementary Material. The review protocol is available online [33].

2.1. Eligibility Criteria. Eligibility criteria were developed using the SPIDER approach [34] to specify Sample, Phenomenon of Interest, Design of the Study, Evaluation, and Research type.

2.1.1. Sample. The sample for this review was older people aged 65 and above with dementia or with cognitive impairment arising from another health condition. Where studies included a wider age range, either two-thirds of participants had to be aged 65 or above, the mean age had to be 70 or above, or data had to be presented separately for those over 65. Participants with dementia were assumed to have cognitive impairment irrespective of whether results of objective cognitive testing were reported, since the presence of cognitive impairment is the key diagnostic criterion. In the case of other conditions where cognitive impairment might or might not be part of the picture (e.g., stroke and Parkinson's disease), cognitive impairment had to be demonstrated through objective test scores, for example,

a mean Montreal Cognitive Assessment (MoCA) [35] score of 25 or below or a mean Mini-Mental State Examination (MMSE) [36] score of 24 or below, and had to affect at least two-thirds of the sample, or data had to be presented separately for participants with and without cognitive impairment. Studies with wider inclusion criteria (e.g., those including older people with sensory or physical disabilities) were selected only if the data from people with cognitive impairment were presented separately.

2.1.2. Phenomenon of Interest. The phenomenon of interest was formal provision of outdoor nature-based activity involving visiting a venue away from the person's place of residence, whether their own home or a long-term care facility. Because our focus was on the formal provision of activities involving engagement with the natural environment undertaken away from the person's immediate home environment, we excluded studies reporting on independent access to nature by older people with cognitive impairment (e.g., dog walking), studies describing access to nature in temporary residential settings (e.g., use of hospital gardens during in-patient stays), and studies that focused on the effects of physical exercise undertaken outdoors without explicitly considering engagement with nature.

2.1.3. Design. Any type of research design was eligible, including quantitative, qualitative, and mixed method studies and evaluations.

2.1.4. Evaluation. Studies had to examine at least one outcome relevant to the effects of, or potentially resulting from, the provision of or participation in the outdoor nature-based activity. Outcomes could be assessed either quantitatively or qualitatively. Assessment could be made from the perspective of people with cognitive impairment, family carers, paid carers, or staff members of the provider organisation.

2.1.5. Research Type. We included peer-reviewed empirical research studies published in English and available in academic or grey literature. For pragmatic reasons, we had to exclude publications in languages other than English. Editorials, commentaries, letters, and opinion pieces were not eligible.

2.2. Information Sources. We searched the following databases from 1st January, 2009 to 20th October, 2022: PubMed, CINAHL (Complete; Environment Complete; Business Source Complete; AgeLine; AMED; GreenFILE; Humanities International Complete; Psychological and Behavioural Sciences Collection), Social Care online, APA PsychInfo, Social Policy and Practice, Web of Science, AgeInfo, ProQuest Dissertations and Theses, OpenGrey, ETHOS, and the King's Fund library. The start date was chosen to provide up-to-date, contemporary evidence, taking account of the possible impact of the introduction of national dementia plans (e.g., South Korea in 2008, the UK in 2009, and the USA in 2011). We additionally hand-searched reference lists of included studies, previous reviews identified through the searches, and key papers and book chapters known to the research team.

2.3. Search Strategy. Search terms were developed through pilot searches and consultation with the interdisciplinary research team and then tailored to each database (see Table 1). Three sets of terms were generated. The first set covered terms related to cognitive impairment (e.g., dementia and Alzheimer's). This was combined with a set of terms related to nature-based activity (e.g., nature-based activities, ecotherapy, and green care) and a set of terms related to volunteering (e.g., volunteer and civic participation). The potential relevance of the latter set of terms was identified through interviews with representatives of provider organisations conducted as part of the wider ENLIVEN project. Because eligible studies might include family members of the person with cognitive impairment and these could be of any age, we did not filter the search results based on age.

2.4. Screening and Eligibility. Search results were uploaded into EndNote (Clarivate Analytics, USA), and duplicates were removed. The screening of titles and abstracts was carried out by two researchers working independently, who then sought to resolve any differences of opinion through discussion. Where agreement could not be reached, the record was added to the list for full-text screening. Full-text screening was conducted by two researchers working independently, with any differences of opinion referred to a third researcher. In cases where we could not determine from the published paper whether inclusion criteria were met, further information was sought from the lead author. Authors were contacted on November 21st, 2022, with responses received by December 19th, 2022.

2.5. Data Extraction. Data extraction was carried out by two researchers working independently using a bespoke extraction form prepared for this purpose in Excel and tested in pilot searches. For quality assurance purposes, 10% of the extractions were checked for accuracy by a third researcher. We extracted data on study characteristics (e.g., author, year, and country of study), participants (e.g., age and level of cognitive impairment), outdoor nature-based activities, the settings in which these were undertaken, the activity providers, and the outcomes that were examined. In keeping with the remit of a scoping review, we did not conduct an appraisal of study quality.

2.6. Synthesis of Results. To answer the first review question, we synthesised information about the outdoor nature-based activities described and grouped studies according to type of activity to provide a narrative account. To answer the second review question, we separately listed quantitative outcomes and the categories or themes identified in qualitative studies

Table 1: Search terms.

Cognitive impairment and outdoor environment (Dement *[Title/Abstract] OR Alzheimer *[Title/Abstract] OR Lewy bod *[Title/Abstract] OR Frontotemporal [Title/Abstract] OR Corticobasal [Title/Abstract] OR Huntington *[Title/Abstract] OR Cognitive impair*[Title/Abstract] OR Neurodegenerative [Title/Abstract] OR Progressive nonfluent aphasia [Title/Abstract] OR Progressive fluent aphasia [Title/Abstract] OR Stroke [Title/Abstract] OR Parkinson *[Title/Abstract] OR Senil *[Title/Abstract] OR Creutzfeldt *[Title/Abstract] OR Multiple sclerosis [Title/Abstract]) AND (green therapy [Title/Abstract] OR blue therapy [Title/Abstract] OR green environment [Title/Abstract] OR blue environment [Title/Abstract] OR green space [Title/Abstract] OR blue space [Title/Abstract] OR green care [Title/Abstract] OR blue care [Title/Abstract] OR greenspace [Title/Abstract] OR green social prescribing *[Title/Abstract] OR Therapeutic landscape *[Title/Abstract] OR Nature therapy [Title/Abstract] OR Natural environment [Title/Abstract] OR Nature assisted [Title/Abstract] OR Nature intervention [Title/Abstract] OR Nature connected *[Title/Abstract] OR Nature based [Title/Abstract] OR Ecotherapy [Title/Abstract] OR Ecotherapy [Title/Abstract] OR Wilderness [Title/Abstract] OR Outdoor *[Title/Abstract] OR Outside environment [Title/Abstract] OR External space [Title/Abstract] OR Land based [Title/Abstract] OR Park [Title/Abstract] OR Coast [Title/Abstract] OR Garden *[Title/Abstract] OR Horticulture *[Title/Abstract] OR Wood * [Title/Abstract] OR Forest [Title/Abstract] OR Farm [Title/Abstract] OR Countryside [Title/Abstract] OR Animal therapy [Title/Abstract] OR Pet therapy [Title/Abstract] OR Companion pet * [Title/Abstract] OR Companion animal *[Title/Abstract] OR Birdwatching [Title/Abstract] OR Horse riding [Title/Abstract] OR Equine assisted [Title/Abstract] OR Equine *therapy [Title/Abstract] OR Water based [Title/Abstract] OR Aquatic [Title/Abstract] OR Sea [Title/Abstract] OR River [Title/Abstract] OR Lake [Title/Abstract] OR Beach [Title/Abstract] OR Walk *[Title/Abstract] OR Trek *[Title/Abstract] OR Heritage [Title/Abstract] OR Touris *[Title/Abstract] OR Holiday [Title/Abstract] OR Vacation [Title/Abstract] OR Leisure [Title/Abstract])
Cognitive impairment and volunteering (Dement * OR Alzheimer * OR Lewy bod * OR Frontotemporal OR Corticobasal OR Huntington * OR Cognitive impair * OR Neurodegenerative OR Progressive nonfluent aphasia OR Progressive fluent aphasia OR Stroke OR Parkinson * OR Senil * OR Creutzfeldt * OR Multiple sclerosis) AND (Volunteer * OR civic partic *)

and then summarised and grouped these by domain to provide a comprehensive overview.

3. Results

3.1. Selection of Sources of Evidence. After removing duplicates, we identified 18,862 unique records. Following title and abstract screening, we scrutinised the full text of 122 articles and identified 28 articles meeting inclusion criteria; see the flowchart in Figure 1 for further details. All involved people with dementia; no studies involving other groups such as stroke survivors met inclusion criteria. Three articles that did not provide information about participants' ages were considered to meet inclusion criteria based on other information or contextual knowledge, as two had similar samples to those in other linked studies meeting inclusion criteria and one involved people living in residential care homes in the UK, which typically have an older population.

3.2. Overview of the Included Studies. The 28 articles all focused on the experiences of older people with dementia; two considered the perspectives of family carers only and one considered the perspectives of service providers only. Three research groups contributed sets of linked studies, reported in four, five, and eight discrete articles, respectively. The remaining 11 articles reported discrete studies. The studies were conducted in Norway ($n = 9$), the USA ($n = 6$), the Netherlands ($n = 5$), the UK ($n = 5$), Canada ($n = 1$), Brazil ($n = 1$), and Japan ($n = 1$). Thirteen studies adopted a quantitative design, nine were qualitative, and six were mixed methods evaluations. Quantitative studies were primarily observational ($n = 11$), using either cross-sectional ($n = 8$) or longitudinal ($n = 3$) data, but also included one quasi-experimental uncontrolled pre/postcomparison and one randomised crossover design; direct behavioural observation of participants during activities was a feature of six studies. Qualitative studies presented data from semi-structured interviews and focus groups, analysed using thematic ($n = 3$), framework ($n = 2$), content ($n = 3$), or descriptive ($n = 1$) analytic methods. Mixed-methods evaluations combined direct observation with survey and interview data or field notes ($n = 3$), reported survey and interview data ($n = 2$), or used participatory appraisal ($n = 1$). A small number of studies analysed or considered findings in relation to specific theoretical models, for example, the Lived Environment Life Quality Model [37], Goffman's theory of social interaction as performance [38], the social health framework [39], and the theory of salutogenesis [40].

Sample sizes for participants with dementia, provided in all but one article, ranged from 4 to 136. In 18 studies, the participants with dementia were day care attenders; four studies were conducted with residents in long-term care facilities and five with people living in their own homes or assisted living, while one included people from a range of living situations. In the rare cases where ethnicity was mentioned, participants were primarily white, with the exception of one study [41] that recruited mainly African-Americans. Gender balance was reported in most studies and varied according to context and type of activity. In most cases where information about the severity of dementia or cognitive impairment was provided, participants were described as having, or had screening scores indicative of, mild-to-moderate dementia, but a few studies included people with moderate-to-severe dementia.

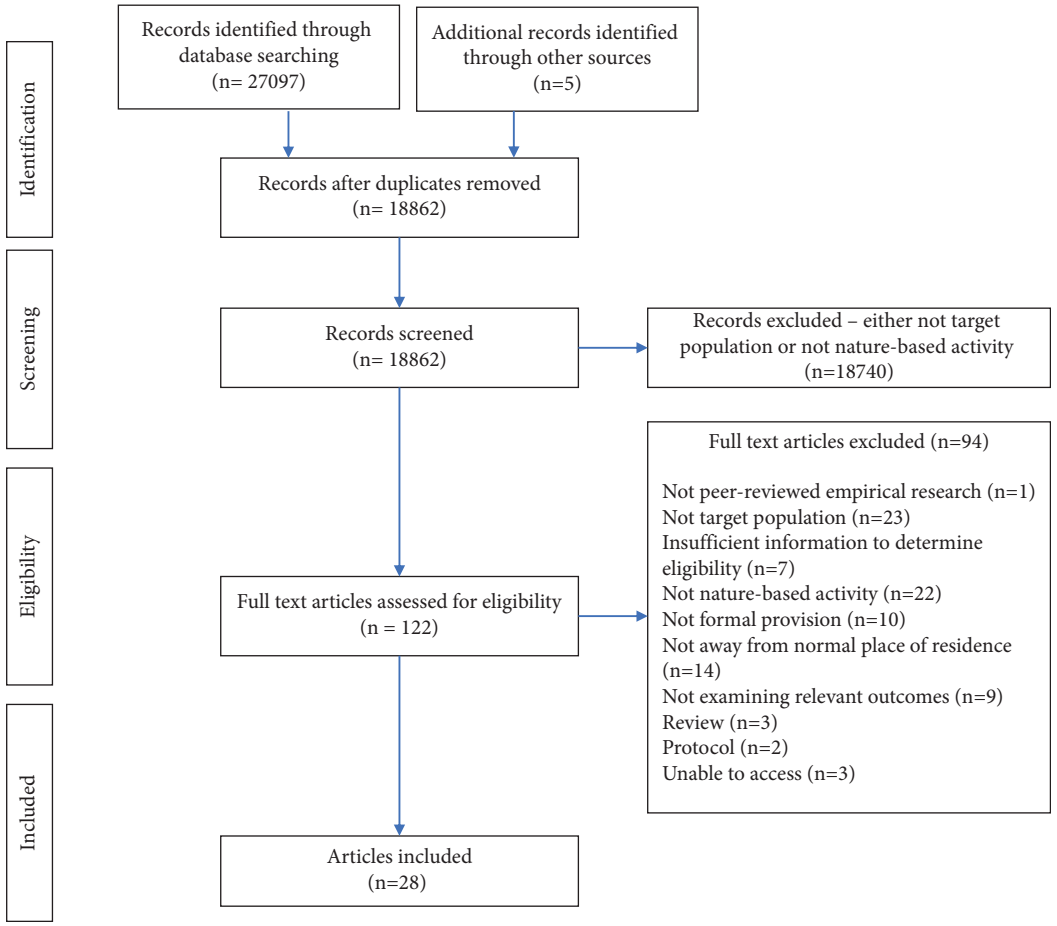

Figure 1: Flow diagram illustrating the study selection process.

With regard to the type of outdoor nature-based activity provided, the 28 studies fell into three distinct groups: green day care (15 articles, of which four were linked studies from one research group in the Netherlands and eight were linked studies from one research group in Norway); equine-assisted interventions (seven articles, of which five were linked studies from one research group in the USA); and community nature-based activities (six articles).

Outcome domains considered in examining the effects of engaging in nature-based activities are summarised in Table 2, including details of the standardised measures used in quantitative studies. Outcomes assessed quantitatively covered participation in activities, clinical characteristics, the physical, functional, psychological, and social domains, and overall quality of life. Qualitative accounts considered the effects of green day care, equine-assisted interventions, or community nature-based activities on connection with nature and on the psychological, social, and physical status of the person with dementia. Connection with nature was considered in terms of the potential for both bringing out past memories and encouraging a future perspective through observing the passage of the seasons and cycle of life, particularly in studies of walking [39] and gardening [42]. Some nature-based activities involved interacting with animals. In these cases, qualitative accounts emphasised the importance of the bonds participants developed with the animals [43]. In the psychological domain, accounts considered the effects of either providing structure and routine, leading to anticipation of pleasurable activity, or creating novel experiences that allowed people to try something new [44]. They explored the impact of taking up valued roles and responsibilities in relation to a sense of purpose and accomplishment [42, 45] and personal empowerment through being able to make choices, decide about taking risks, relearn skills, or develop new skills [46]. In the social domain, outcomes included the effects of joining a group, sharing experiences, and feeling part of a wider community on social isolation and feelings of loneliness [39, 47, 48], as well as the quality of relationships between people with dementia and their family carers or paid care staff [49]. In the physical domain, qualitative accounts focused on the effects of activity on physical health, diet, mobility, and balance [46, 50].

Below, we examine the three groups of included studies in more detail, covering the nature of the activities and the outcome domains explored in the research.

3.3. Green Day Care. The 15 articles focusing on the provision and outcomes of green day care are summarised in Table 3. Of these, 13 addressed day care provision at

Table 2: Outcome domains addressed and standardised measures used in the included studies.

Domain	Indicative content	Standardised measures and tools used
Nature and the outdoors	Accessing the outdoors, time spent outdoors, and being in a safe and supportive outdoor environment Attitudes to outdoor activity Connection to nature	N/a
Activity participation	Activity engagement Time use (e.g., gaze, conversation, and participation)	Activity in content and time observational measure Maastricht electronic daily life observation tool
Clinical characteristics	Dementia severity, cognition Awareness Neuropsychiatric symptoms, depression, anxiety Problematic behaviour in the care setting	Mini-Mental State Examination Montreal Cognitive Assessment Clinical Dementia Rating Anosognosia Rating Scale Montgomery and Asberg Depression Rating Scale and Cornell Scale for Depression in Dementia Rating Anxiety in Sementia Scale Neuropsychiatric Inventory Questionnaire Nursing Home Behaviour Problem Scale
Physical health	Physical status, co-morbidity Medication use Physical activity and effort Balance, agility, muscle strength Nutritional status, dietary intake	Euro-QoL Visual Analogue Scale General Medical Health Rating Timed Up and Go test Mini Nutritional Assessment Simplified Nutritional Appetite Questionnaire
Functional ability	Basic and instrumental activities of daily living	Barthel Index Interview for Deterioration in Daily Living in Dementia Physical Self-Maintenance Scale Instrumental Activities of Daily Living Scale
Psychological health	Emotional well-being or ill-being Observed mood Stress Identity, agency, personhood Confidence Enjoyment	WHO-5 Well-Being Index Modified Shorter Warwick-Edinburgh Mental Well-Being Scale Activity in content in time observational measure Maastricht electronic daily life observation tool Philadelphia Geriatric Centre Affect Rating Scale Dementia Care Mapping
Social health	Social contact, social participation, social connections, social relationships, social support, social health, and social inclusion Relationship quality	Oslo Social Support Scale
Quality of life	General quality of life	Quality of Life in Alzheimer's Disease (QoL-AD)
Carer perspective	Impact of the service or activity on the person with dementia (e.g., sustained change in behaviour; enjoyment) Impact of the service or activity on the carer (e.g., respite, surprise at what the person with dementia can do)	N/a

green care farms in Norway and the Netherlands, one reported on an initiative to introduce the green care farm concept into Japan using rice farming which is widely practised in East Asia, and one explored nature-based adult day care provision in urban areas. There were nine quantitative, five qualitative, and one mixed-methods research designs, and sample sizes ranged from 10 to 136 people with dementia.

Green care farms are specialist facilities, typically linked to commercial working farms, where small groups of people with dementia, attending one or more days per week, are exposed to a care experience that is embedded in nature and the outdoors in the context of a home-like domestic environment. Some green care farms provide residential care, but for present purposes only day care provision was relevant. Day care programmes at green care farms include outdoor activities such as feeding animals, cleaning pens, yard work, and gardening, as well as domestic activities such as meal preparation.

Two linked studies [51, 52] examined the characteristics of people attending day care at green care farms and the factors associated with quality of life for these individuals. These studies also explored predictors of withdrawal from green day care at one-year follow-up; variables considered were clinical characteristics (dementia severity, awareness, depression, anxiety, neuropsychiatric symptoms, and so on), physical health, functional ability, social support, and quality of life. Two qualitative studies explored the perceptions of people with dementia [40] and family carers [53] regarding their experiences of day care at green care farms and its impact, focusing on social relationships, occupation, the extent to which services are individually tailored, and the

Table 3: Studies of green day care.

Study	Aim	Design	Participants	Setting	Description of the programme	Outcomes assessed or elicited
de Bruin et al. 2009 study 2 Netherlands	To identify, describe, quantify, and compare the activities of older men and women with dementia attending green care farms and regular day care	Cross-sectional observational study. Participants were observed for either 1 or 2 days with the main activity in each 15-minute period recorded	55 people with dementia aged 65 or above; 30 (25 male) attending a green care farm and 25 (7 male) attending a regular day care facility; mean MMSE scores in the range 18–20	11 green care farms and 12 regular day care facilities in the same region. The regular day care facilities were socially oriented rather than providing medical treatment, and mostly linked to residential care homes	Day care programme at green care farms include outdoor activities such as feeding animals, cleaning pens, yard work and gardening as well as domestic activities such as meal preparation. Day care programmes at regular facilities include mostly indoor leisure and recreational activities	Extent of participation in organised activities; types of activities undertaken; time spent outdoors; physical effort expended
de Bruin et al. 2010 Netherlands	To compare dietary intake of older people with dementia attending green care farms and regular day care	Cross-sectional observational study	53 people with dementia aged 65 or above; 30 (85% male) attending a green care farm and 23 (30% male) attending a regular day care facility	10 green care farms offering day care to groups of 5–15 frail older people per day and 10 regular day care facilities in the same region	Day care programmes as above	Dietary intake, nutritional status, body mass index, appetite
de Bruin et al. 2012 Netherlands	To compare functional ability and rate of functional decline, co-morbidity and medication use of older people with dementia attending green care farms and regular day care	Observational longitudinal cohort study. Data were collected from primary carers at baseline, 6 month follow-up, and 12 month follow-up. Participants were divided into 3 groups reflecting duration of attendance at day care	88 people with dementia aged 65 or above; 47 attending green care farms and 41 attending regular day care facilities. Mean MMSE scores in the range 19–22	15 green care farms offering day care to groups of 5–15 frail older people per day and 22 regular day care facilities in the same region		Instrumental activities of daily living (rated by carer), co-morbidity, medication use
de Bruin et al. 2015 Netherlands	To explore the value of day care at green care farms in terms of social participation for people with dementia	Qualitative study. Semistructured interviews were analysed using framework analysis	21 people with dementia (mean age 71.1, 18 male) attending green care farms, 12 people with dementia (mean age 76.1, 10 male) on waiting lists to attend green care farms, and 17 people with dementia (mean age 85.4, 8 male) attending regular day care	Participants were recruited through 10 green care farms and 5 regular day care facilities in the same region, and interviewed at home	Day care programmes as above	Comparison of the three groups regarding initiation of day care, selection of day care setting, and domains of social participation experienced

Table 3: Continued.

Study	Aim	Design	Participants	Setting	Description of the programme	Outcomes assessed or elicited
de Bruin et al. 2021 Netherlands	To elucidate the value of nature-based adult day services in urban areas for the health and well-being of people with dementia and carers	Qualitative study. Semistructured interviews were analysed using framework analysis	21 people with dementia (majority male; age available for 16, mean 74.5) and 18 family carers (10 interviews were with dyads); 17 providers of nature-based adult day care services in urban areas	Participants were involved with 15 nature-based adult day services in urban areas	Nature-based adult day services offered in settings such as city farms, community gardens, and nursing home gardens, and provided by health and social care professionals, social entrepreneurs, social care organisations or community groups. Participants can undertake a wide range of outdoor activities as well as indoor, domestic, and recreational activities	Types and characteristics of nature-based day care services provided; motivation to initiate nature-based day care (perspectives of people with dementia and carers only); value of nature-based day care for people with dementia (all three perspectives); value of nature-based day care for carers (perspectives of carers and providers only)
Myren et al. 2017 Norway	To describe the influence of place on everyday life in day care services at a green care farm and a regular day care facility	Qualitative descriptive study. Observations and informal conversations analysed with inductive manifest content analysis	14 people with dementia (mean MMSE score 21); 8 attending the green care farm (mean age 77, 2 male) and 6 attending regular day care (mean age 68, 5 male); 9 staff members from the two facilities	A green care farm providing a home-like setting in a rural area and a regular day care facility in a suburban area	Day care programmes	Influence of place, reflected in the main category of enabling and collaboration in daily life, and depending on the physical and social environment, and the type of activities (including active versus passive participation)
Ibsen et al. 2020a Norway	To describe the characteristics of people with dementia attending farm-based day care and identify associations of individual and farm characteristics with quality of life	Quantitative observational study	94 people with dementia (mean age 76, 62% male, most in the early stages of dementia)	Participants attended 25 farm-based day care services (all 35 such facilities in Norway were contacted)	Farm-based day care programmes	Characteristics: dementia severity, awareness, depression, anxiety, neuropsychiatric symptoms, physical health status, functional ability, social support and quality of life. Factors associated with quality of life (measured by QoL-AD) and variation in QoL between settings

Table 3: Continued.

Study	Aim	Design	Participants	Setting	Description of the programme	Outcomes assessed or elicited
Ibsen et al. 2020b Norway	To identify characteristics and next destinations of people who withdraw from farm-based day care services	One-year follow-up of the participants in Ibsen et al. 2020a; information given by service providers	92 people with dementia from the sample reported in Ibsen et al. 2020a	At baseline participants attended one of 25 farm-based day care services	Day care programmes	Demographic and clinical characteristics of those withdrawing and continuing; factors predicting withdrawal; whether transferred to residential care or continued to live at home; if living at home, whether transferred to regular day care
Garshol et al. 2020a Norway	To investigate the potential of farm-based day care services to promote physical activity for people with dementia, in comparison with regular day care	Secondary cross-sectional analysis of data from two studies, one focused on farm-based day care and the other on regular day care	136 people with dementia; 29 (mean age 74, mean CDR 1.22, 20 male) attending farm-based day care and 107 (mean age 84.3, mean CDR 1.52, 36 male) attending regular day care	Participants attending farm-based day care were recruited from 15 services, and participants attending regular day care were recruited from municipal day care centres in 3 counties	Day care programmes	Level of physical activity established from actigraphy data
Ellingsen-Dalskau 2021 Norway	To compare the quality of care at green care farms and regular day care	Direct observation of participants using ecological momentary assessment of activities	42 people with dementia attending farm-based day care; 46 people with dementia attending regular day care. No demographic information was provided but the profile of participants is likely to be similar to that of the participants in Ibsen et al. 2020a	10 farm-based day care services and 7 regular day care services	Day care programmes	Type of activity, level of engagement, physical effort, location, social interaction and mood
Garshol et al. 2020b (PhD thesis paper 3) Norway	To compare quality of life over time for people with dementia attending farm-based day care or regular day care, and examine individual and contextual predictors of quality of life over time for those attending farm-based day care	Secondary analysis of baseline and 12-month follow-up observational data from two studies, one focused on farm-based day care and the other on regular day care	Farm-based day care: 45 (mean age 74.7, 28 male) of the 94 recruited by Ibsen et al. 2020a who remained in the study at 12-month follow-up and were included in analyses. Regular day care: 100 (mean age 81.5, 40 male) of the 183 people recruited who remained in the study at 12 month follow-up	Participants attending farm-based day care as described by Ibsen et al. 2020a; participants attending regular day care were recruited through invited day care centres	Day care programmes	For both groups: depression, neuropsychiatric symptoms, co-morbidity, physical activity level, quality of life (QoL-AD, self- and carer rated). For farm-based day care group only: well-being (WHO-5), social support, time spent at day care, time spent outdoors

Table 3: Continued.

Study	Aim	Design	Participants	Setting	Description of the programme	Outcomes assessed or elicited
Ibsen and Eriksen 2021 Norway	To investigate how people with dementia describe their experience of attending farm-based day care and the interactions they have	Qualitative study. Semistructured interviews analysed using manifest and latent content analysis. Findings discussed in the context of the theory of salutogenesis	10 people with dementia (all but one aged over 65; 6 male)	5 farm-based day care services	Farm-based day care programmes	How attending day care makes them feel, across the categories of social relations, being occupied, and the extent to which the service is individually tailored
Taranrod 2021 Norway	To explore the experiences of family carers whose relative attends farm-based day care	Qualitative study. Semistructured interviews analysed using content analysis	8 carers (4 spouses, 4 adult children) of people with dementia (all aged over 65 with mild-to-moderate dementia)	Participants were recruited from 7 farm-based day care services in rural or suburban areas	Day care programmes	How farm-based day care affected their daily lives; perceptions of the service at the farm; farm-based day care as a stage in the dementia trajectory
Garshol et al. 2022 Norway	To compare the emotional well-being of people with dementia attending farm-based day care and regular day care and identify differences related to differences in the care environment and to type of activity	Direct observation of participants using ecological momentary assessments	42 people with dementia attending farm-based day care; 46 people with dementia attending regular day care. No demographic information was collected but the profile of participants is likely to be similar to that of the participants in Ibsen et al. 2020a	10 farm-based day care services and 7 regular day care facilities	Day care programmes	Observed mood as an indicator of emotional well-being
Ura et al. 2021 Japan	To implement green care farms that use rice farming, explore the experience of participating, and compare the effect on well-being and cognition relative to regular day care	Realist-informed convergent parallel mixed methods design. Quantitative data were collected from both the rice farming and reference groups and additionally qualitative data were collected from the rice farming group	Rice farming group: 15 people with dementia (mean age 75.6) attending the rice farming programme in addition to attending regular day care or receiving standard care in a group home reference group: 14 people with dementia (mean age 79.9) attending regular day care or receiving standard care in a group home. Rice farming group had more males and more people with prior experience of rice farming	Participants were recruited from two day care facilities and two group homes. The reference group were recruited from facilities located at a distance that precluded participation in the rice farming care programme	Rice farming care programme one hour per week for 25 weeks, from rice planting through to harvesting	Quantitative: participation rate at the green care farm, well-being, cognition. Qualitative: enjoyment, connection

impact of farm-based day care on everyday life and future perspectives.

Seven quantitative studies and two qualitative studies made comparisons between people with dementia attending day care at green care farms and regular socially oriented day care facilities offering leisure and recreational activities [38, 45, 50, 54–59] and one study [57] additionally examined predictors of quality of life for people attending green care farms. Variables included in quantitative analyses were as follows: quality of life; activity engagement, focusing particularly on physical activity and effort and time spent outdoors; emotional well-being, social connections; physical health including co-morbidity, medication use, and dietary intake; functional ability in activities of daily living; and clinical characteristics including depression, neuropsychiatric symptoms, and medication use. Qualitative comparisons focused on the initiation of day care, the choice of day care setting, and the influence of different kinds of settings and activities on social participation. There was a preponderance of men among the green care farm samples, some but not all with prior farming experience, and a higher proportion of women attending regular day care.

One study [49], introducing the concept of green care farms to Japan for the first time, explored the effects of adding a rice farming programme consisting of weekly one-hour sessions to regular day care provision relative to a reference group attending regular day care only. Quantitative indicators were well-being and cognition, and qualitative indicators were enjoyment and connection.

While green care farms are predominantly situated in rural or semirural areas, nature-based day care services can also be found in urban areas, in settings such as city farms, community gardens, and nursing home gardens. Nature-based day care may be provided by health and social care professionals and organisations or by social entrepreneurs and community groups. One study [43] examined the types and characteristics of urban nature-based day care services, motivations for choosing them, and their value to people with dementia and carers.

3.4. Equine-Assisted Interventions. The seven articles describing equine-assisted interventions for people with dementia are summarised in Table 4. These interventions were delivered at accredited therapeutic riding centres by specialist staff, with a high ratio of support staff and volunteer helpers to participants. The interventions involved interacting with the horses (e.g., tacking up, grooming, leading, and feeding), and in most but not all cases, riding the horses. There were five quantitative and two qualitative studies; sample sizes ranged from 4 to 26 people with dementia. Participants were drawn from residential care (three studies), day care (one study), or community (three studies) sources.

One study [60] examined the effects of an equine-assisted intervention on balance, agility, muscle strength, and cognition. Direct behavioural observation was used to examine participants' reactions in four studies, focusing on quality of life indicators such as time use (e.g., gaze, conversation, and participation) and emotional well-being (e.g., pleasure and agitation). One study [37] described quality of life indicators displayed by participants during the activity. Two studies compared quality of life indicators observed during the activity to those observed during other activities in either long-term residential care [44] or regular day care [41], with the latter study also examining stress levels through analysis of salivary cortisol and care staff reports of problematic behaviour in the day care setting in a randomised crossover design. One study [42] compared quality of life indicators shown by a group of people with dementia who chose to participate in a horse-riding activity with those shown by a comparison group who chose to engage in a gardening activity. Two qualitative studies explored the perspectives of family members [61] and service providers [62], describing outcome domains of well-being, functional ability, and social relationships.

3.5. Community Nature-Based Activities. The six studies focusing on outdoor nature-based activities in community settings are summarised in Table 5. Two studies used qualitative methods and four adopted a mixed methods evaluation approach; sample sizes, available for five studies, ranged from 6 to 39 people with dementia. Participants were drawn from residential care (one study), day care (two studies) or community (two studies) sources, or a mixture of these (one study).

Two studies [48, 63] examined the experience and impact of participating in therapeutic gardening sessions provided in addition to regular day care. Both studies explored staff and care partner perceptions; one [63] used Dementia Care Mapping to identify instances of well-being and ill-being, while the other [48] conducted group interviews with participants, exploring the impact on identity, agency, and sense of community. One study [39] examined the effect of attending dementia-friendly walking groups on the social health of people with dementia living in the community and their family carers, focusing on social contact, being in a safe environment, and accessing the outdoors.

The remaining three studies are all linked to Dementia Adventure, a British charity and social enterprise that works to enable people with dementia to get outdoors and connect with nature. The first of these [46] describes a pilot project providing days out in woodlands for care home residents; data about the physical, emotional, and social impact and perceived importance of various aspects of a woodland visit were collected. The second [47], reports findings from the evaluation of Dementia Adventure small group or bespoke holidays provided during 2016, considering perceived changes in emotional, social, and physical well-being, confidence, and relationships. The third [64] evaluates a project in which Dementia Adventure worked with partner organisations to support the provision of opportunities for people with dementia to access the natural environment, examining the impact of participation on mental well-being and physical activity, enjoyment of the sessions, and perceived benefits.

Table 4: Studies of equine-assisted interventions.

Study	Aim	Design	Participants	Setting	Description of the programme	Outcomes assessed or elicited
Dabelko-Schoeny et al. 2014 Ohio, USA	To determine the feasibility and effectiveness of equine-assisted intervention to improve the physiological and behavioural state of people with dementia	Randomized pretest posttest crossover design comparing the intervention to treatment as usual (crafts, exercise, discussion groups, rest periods)	16 people with mild-to-moderate dementia and mean MMSE score 20.8, mostly African-American, recruited from an adult day care centre and randomly assigned to receive the equine-assisted intervention in either the first or second group	Farm	Multi-component programme with three 15-minute components: (a) opportunities for grooming, (b) interacting (tacking up, observing, leading), and (c) painting symbols on the horses according to native American custom, followed by washing the horse and offering food	Behaviour was observed and recorded every 30 seconds during the grooming and painting components of the intervention using the Philadelphia Geriatric Centre Affect Rating Scale; salivary cortisol levels were taken at baseline and before and after intervention sessions as a measure of stress; day centre staff completed a modified version of the Nursing Home Behaviour Problem Scale at baseline, immediately after the intervention and at follow-up to evaluate effects on disruptive behaviours in the day care setting
Busselman 2017 MSc dissertation Colorado, USA	To investigate the quality of life (QoL) indicators, and their environmental correlates, that are offered during an equine-assisted intervention	Descriptive case study. Video-recorded observations coded quantitatively using activity in context in time method; field notes analysed qualitatively using lived environment life quality model	4 people with mild-to-severe dementia living in long-term care, all aged 65 or above	PATH Intl accredited therapeutic riding centre	Riding in the moment equine-assisted intervention; 4 one-hour group sessions over 4 weeks	Positive and negative QoL indicators present during video-recorded observations. Field notes analysed for occupational opportunities offered, and physical and social environmental supports needed to promote engagement

Table 4: Continued.

Study	Aim	Design	Participants	Setting	Description of the programme	Outcomes assessed or elicited
Fields et al. 2018 Colorado, USA	To compare instances of positive, negative and neutral behavioural indicators of QoL during an equine-assisted activity programme with those demonstrated during 8 other activities (downtime, TV, meals, physical therapy, games, joke and riddle time, bus ride to riding centre)	Descriptive case study. Direct observation using hand-held computers programmed with activity in context in time subdomains and an instantaneous sampling strategy; 4 hours twice-weekly for 8 weeks	6 people with mild-to-moderate dementia living in long-term care who expressed interest in horses; mean age 83.3 years, range 71–95; 4 female; 5 considered to have moderate dementia	PATH Intl accredited therapeutic riding centre	Equine-assisted intervention once a week for 8 weeks	QoL indicators in the time use (e.g., gaze, conversation, participation) and emotional well-being (e.g., pleasure, agitation) domains
Fields et al. 2019 Colorado, USA	To elicit the perspective of providers of equine-assisted activity programmes and long-term care activity directors regarding impact of equine-assisted activity programmes on quality of life of residents with dementia	Qualitative study. Semistructured interviews analysed *in Vivo* using the approach of basic qualitative description	3 providers from therapeutic riding centre and 2 activity directors from long-term care facility	N/a	N/a	Outcomes: well-being, functional abilities and social relationships mechanisms: connection with horses and nature, social participation, holistic experience good dementia care: recognise the person, communication, safety
Lassell et al. 2021 Colorado, USA	To compare QoL indicators during two activities, horse riding or gardening, adapted for people with dementia; participants self-selected one or other activity	Descriptive case study. Video-recorded observations coded quantitatively using activity in context in time method; durations for each QoL indicator averaged per participant and aggregated by group for nonparametric statistical comparison	8 people with dementia, 4 per activity, recruited from local organisations and each accompanied by one family carer during the intervention sessions. RBANS scores indicated severe cognitive impairment in all cases. Two care partners described the person with dementia as in the mild-to-moderate stage and two as in the moderate-to-severe stage	Riding sessions were held at a PATH Intl accredited therapeutic riding centre; gardening sessions took place on the patio of a local senior centre or indoors during inclement weather	4 sessions of riding or 4 sessions of gardening	Active participation and emotional well-being

Table 4: Continued.

Study	Aim	Design	Participants	Setting	Description of the programme	Outcomes assessed or elicited
Lassell et al. 2022 Colorado, USA	To examine how family members perceived the outcomes of participation in a riding programme for people with dementia	Qualitative study semi-structured interviews with care partners 1-2 weeks after completion of the programme, lasting 45–90 minutes, and supplemented by field notes. Analysed qualitatively *in NVivo* using theoretical thematic analysis	Five carers, 3 spouses and 2 daughters; 3 females; mean age 58. The care recipients had varying types and severities of dementia and a mean age of 70, and 4 lived in the community while one resided in assisted living		Hour-long sessions once a week for 8 weeks	Three themes: well-being (uplifted mood, shared positive experience; accomplishment and purpose); meaning through social connections (witnessing a positive event, belonging and validation, the horse-human connection); function in daily life (balance and endurance, communication, cognition and increased activities)
de Araujo et al. 2019 Brasilia, Brazil	To describe the effects of equine-assisted therapy on balance, functional capacity, and cognition in older people with Alzheimer's disease	Quasi-experimental, uncontrolled pretest posttest design	9 people with mild-to-moderate dementia (CDR 0.5–2) completed the study; mean age 78.6 years, age range 68–90, 3 female. Convenience sample recruited from local referral centre and through referrals from other outpatient clinics and media advertisements	Riding centre	Twice-weekly 30-minute sessions for 10 weeks, which included riding the horse	Static balance; dynamic balance and agility (Timed Up and Go); muscle strength (30s-CST); cognition (MMSE and verbal fluency)

Table 5: Studies of community nature-based activities.

Study	Aim	Design	Participants	Setting	Description of the programme	Outcomes assessed or elicited
Evans et al. 2022 UK	To report the evaluation of a project that worked with national providers to give people living with dementia opportunities and support to access the natural environment	Mixed-methods evaluation involving questionnaires for people with dementia, carers and delegates, and in-depth case studies at five project locations including interviews with people with dementia and carers, analysed thematically	35 people with dementia (mean age 81 years 10 months, 51% female) and 15 carers participated in the evaluation	Activities were provided in 44 locations by 64 delegates, comprising 913 activity sessions (164 single sessions and 749 as part of 33 series), with 2490 attendances by people with dementia and 582 by family carers. Outdoor activities included nature walks, farm and woodland activities, gardening and visits to the beach. A small number of activities were not nature-based or were not conducted outdoors	Pilot of the Dementia Adventure in a Box social franchise with four delivery partners: a care home operator, a provider of schemes supporting people to live independently at home, a network organising volunteer-led outdoor activities for disadvantaged people, and a charity promoting the therapeutic use of farming practices and care farms. For a 12-month period delegates from each organisation were trained and supported to implement and evaluate a programme of outdoor nature-based activities	Quantitative: impact of taking part in activities on mental well-being and physical activity levels. Qualitative: enjoyment of sessions and perceived benefits
Hall et al. 2018 Ontario, Canada	To examine the impact of outdoor horticultural therapy sessions on people with dementia attending a day care programme	Exploratory mixed methods study. Direct observation using dementia care mapping; field notes analysed thematically; questionnaire to care partners at the end of the programme	14 people with dementia (mean age 84, mean MMSE score 20, 10 males) with a previous interest in gardening attending a day care programme	Specially designed therapeutic garden space of a long-term care home with an attached day care programme	Outdoor horticultural therapy sessions twice weekly for 10 consecutive weeks	Level of well-being and ill-being, and behaviours engaged in, during horticultural therapy. Staff and care partner perceptions regarding the impact of horticultural therapy
Mapes 2012 England, UK	To gather evidence about the benefits of activity in woodlands for care home residents with dementia	Action research project using the participatory appraisal method. Data about participants and their responses were gathered before the visit and towards the end of the visit with individuals and small groups	24 care home residents with dementia, 9 family carers, 29 staff and volunteers	Woodlands within a 45-minute drive of the 3 participating care homes that offered accessible facilities	Wandering in the Woods pilot project providing a day out in nature for care home residents. Three woodland days out were undertaken, one for each of the 3 care homes	Physical, emotional and social benefits; perceived importance of different aspects of a woodland visit

Table 5: Continued.

Study	Aim	Design	Participants	Setting	Description of the programme	Outcomes assessed or elicited
Mapes 2017 England, UK	To report findings from the evaluation of Dementia Adventure holidays provided during 2016 and present considerations for outdoor nature-based positive risk-taking activities	Mixed method design. Participant observation, feedback, follow-up interview and survey data	39 people with dementia (20 male) and 38 carers attended 16 holidays	Small group or bespoke holidays in 7 locations in England	Dementia Adventure is a charity and social enterprise working to enable people with dementia to get outdoors and connect with nature	Changes in emotional, social and physical well-being, confidence and relationships
Noone and Jenkins 2018 Scotland, UK	To explore the experience of participating in a community-based gardening programme for people with dementia	Action research project with a phenomenological perspective. Semistructured group interviews with participants following each session; field notes; semistructured interviews with four day centre staff and with one occupational therapist and two community gardeners who had experience of working with people with dementia in gardens. Analysed using thematic analysis	6 people with dementia aged over 65 attending a day care centre who expressed an interest in gardening	A garden in the grounds of the community hall that hosted the day care centre	Weekly gardening sessions over a six-week period	Impact on identity, agency, and sense of community
Robertson et al. 2020 Scotland, UK	To examine the impact of attending dementia-friendly walking groups on social health of people living with dementia and family carers; to consider how inclusive walking groups can support people with dementia to remain connected in their communities	Co-produced participatory design using the concept of social health as a theoretical framework. Walking interviews with a person with dementia and carer from each group. Focus group following each walk, 6 in total, involving people with dementia, carers and volunteers. Separate focus groups with paid co-ordinators from health walk projects. Data analysed thematically; a secondary thematic analysis applied social health as a theoretical lens	People with dementia aged 65 and above and their family carers; volunteers; paid co-ordinators of health walk projects. No further details provided	6 dementia-friendly walks; 1 rural, 1 semirural near water, and 4 in natural spaces within towns and villages	6 groups selected from a charity-led national programme of 23 dementia-friendly walking groups attended by people with dementia, carers, volunteers, and other walkers	Impact of being with others, being in a safe and secure social environment, and accessing the outdoors

4. Discussion

In this scoping review, we set out to characterise the research evidence on the provision of any type of outdoor nature-based activity for older people with dementia or other forms of cognitive impairment, considering both the range of activities studied and the outcome domains examined. This is, to the best of our knowledge, the first scoping review to focus on formal activity provision, to consider older people with any form of cognitive impairment, and to cover a broad range of outdoor nature-based activities rather than focusing on one specific type of activity. Systematic literature searches yielded 28 articles meeting our inclusion criteria, all relating to older people with dementia. Just over half focused on nature-based day care. The remainder considered equine-assisted interventions and community nature-based activities including gardening, walking groups, woodland visits, and adventure holidays, with participants drawn from day or residential care settings, community sources, or a mixture of these. Outcomes assessed quantitatively included activity participation, the impact of participation on clinical symptoms, functional ability, physical, psychological, and social health, and overall quality of life. Qualitative accounts focused on outcomes in terms of connection with nature and on the psychological, social, and physical status of the person with dementia, as well as impacts on family carers.

The included studies mainly involved participants already attending or residing in formal care settings. Around half of the studies reported on day care provision, and participants in over three-quarters of the studies were either attending day care or living in residential care. Most of the available evidence relates to day care provision as a whole or to the impact of adding specific activities to those usually offered as part of socially oriented day care provision. Studies of day care provision either explored the specific impact of nature-based day care or compared the relative benefits of nature-based and regular day care. This is important because the availability of a range of evidence-based day care options allows for an element of choice and personalisation, as well as flexibility when care needs change. Similarly, offering a wider range of options within regular day care services or for people living in residential care by providing outdoor nature-based activities could promote choice and enrich everyday experience, either reconnecting people with familiar or previously enjoyed activities, such as horse riding or gardening [42, 44] or providing the stimulus of trying something new or different. While it might be assumed, for example, that day care on a green care farm would be suitable mainly for those with prior experience of farm work, findings suggested that this appealed also to those without such prior experience [40].

Relatively few studies involved participants drawn from community sources or reported on community-based initiatives that were not connected to existing formal care services. Consequently, evidence in this area was limited to equine-assisted interventions, walking groups, and adventure holidays, with one further evaluation [64] covering a mixed set of outdoor nature-based activities including gardening, nature walks, visits to farms, woodlands, or beaches. This evaluation noted that while project aims were to train provider organisations to offer outdoor nature-based activities, only about 70% of the activities conducted could be described as nature-based, and about 10% of the nature-based activities were held indoors, reflecting some of the potential challenges of implementation. While community initiatives to promote outdoor nature-based activity are relatively unlikely to be reported in the research literature in the absence of academic involvement of some kind, the range of community-based activities our searches identified appeared reasonably consistent with the findings of an internet-based search of community nature-based activity provision for older people with cognitive impairment in the UK conducted by the ENLIVEN team. Nevertheless, the activities reported in research and associated grey literature may not fully reflect either the range of activities that have been attempted in community settings or the creative potential for imaginative development of innovative approaches.

While interventions are designed to address clinical need, it is essential to seek robust evidence of improvement in the relevant outcomes to better understand the mechanisms involved and to guide future practice. It was noteworthy that several studies included direct observation of participants to establish how they engaged in and responded to the activities offered and to check that participants appeared to find the activities interesting and enjoyable [42, 44, 54, 58, 59]. However, although some of the included studies focused on common clinical issues such as problem behaviours or depression or considered levels of well-being and quality of life [41, 57, 60], in no cases were participants selected based on a specific clinical need. In most studies, participants were included due to their diagnosis or because they attended a particular day care setting. This could create challenges for outcome evaluation. Where, for example, quality of life scores are already reasonable, or there are few symptoms of depression, it will be difficult to evidence improvements resulting from participation, even if qualitative accounts suggest that people enjoy the activities and find them beneficial. In these cases, engagement, satisfaction, and perception of benefit would appear to be the most salient outcomes. These kinds of person-centred outcomes are the key considerations for community-based initiatives and are important to inform the iterative process of developing and refining activities that meet the wishes and aspirations of older people with dementia and other forms of cognitive impairment.

5. Limitations

Our inclusion criteria had some significant implications. We aimed to include older people with any form of cognitive impairment. However, studies of people with conditions other than dementia, such as stroke survivors, typically did not recruit based on age or cognitive impairment. Therefore, we considered but had to exclude a small number of studies that did not meet criteria for either age or cognitive impairment, for example, studies of forest walking for

poststroke depression and anxiety [65], nature-based rehabilitation for poststroke fatigue, anxiety, and depression [66], and equine therapy for gait, balance, and mood in Parkinson's disease [67, 68]. This meant that in practice, all the included studies focused on people with dementia, a condition where the presence of cognitive impairment is a given, but a small proportion of people are diagnosed below the age of 65. We excluded only two small-scale studies involving people with dementia due to our age criterion: one focused on people with young-onset dementia engaging in a gardening group [69], and in the other, which explored a pilot programme of woodland activities, fewer than two-thirds of the participants were aged 65 or over [70]. Four articles were excluded because they provided insufficient information to be sure that our inclusion criteria were met. In three studies of community gardening programmes, the ages or diagnoses of participants were not known to the researchers [71–73], and for one study of woodland visits, no further details could be obtained [74]. To be included, studies had to report on activities that were nature-based and specifically consider the effects of being in nature. Some studies described outdoor activities such as neighbourhood walking groups [75], a safe walking programme for people who "wander" in long-term care [76], or sporting or physical activities that take place outdoors such as golf [77] or trekking [78], but were excluded because they did not explicitly consider the effects of being in nature.

For pragmatic reasons, our systematic literature searches were limited to studies published in the English language. The studies identified were conducted primarily, although not exclusively, in English-speaking or other European countries, and all but one were undertaken in high-income countries. Beyond age and gender, we noted very limited reporting of basic dimensions of diversity such as ethnicity. We were unable to comment on the extent of inequities in provision and access due to ethnicity and other factors such as socioeconomic status, geographical location, area-level deprivation, and the availability of community resources and volunteers, but consider that all these factors could be salient, raising questions about how to ensure that provision is targeted to those in greatest need.

6. Implications

Recommendations for maintaining well-being among people with dementia emphasise the importance of enabling people to participate in activities that match their personal preferences and needs [79]. This implies that older people with cognitive impairment should be able to choose something that appeals to them from among a range of options that support inclusion and participation. As the health and well-being benefits of being in nature are well-established and increasingly understood [9–11], and older people with cognitive impairment can experience significant barriers to access, whether intrinsic or extrinsic, it is important that nature-based activities should be part of this offer. What, therefore, does the literature reviewed suggest about how this can be achieved and what more do we need to know?

The review indicates that nature-based activity can serve several different purposes. It can be offered as an opportunity for meaningful and enjoyable occupation to enrich daily life, as a framework for the provision of day care, or as an intervention to address clinical needs. Regarding meaningful and enjoyable occupation, this review describes the kinds of outdoor nature-based activities offered for this purpose and demonstrates that it is feasible to provide such activities and evaluate their benefits. It also highlights the relative paucity of research evidence about community nature-based activities, especially where participants are drawn from community sources rather than care settings, and the limited set of activities studied, which may not fully reflect either what is available or the potential that exists to develop provision in this area. These points to the need for knowledge exchange among older people with cognitive impairment and their families, providers or potential providers of activities, and researchers to realise this potential. Greater understanding of preferences and needs will help to ensure provision is tailored appropriately and allow for creative development of new approaches, and careful attention to participants' responses and reactions will support effective and inclusive provision that can overcome intrinsic barriers such as loss of confidence. Addressing the extrinsic barriers that limit access, such as inadequate facilities and transport or being resident in a long-term care setting [46], is also essential, suggesting that providers, and funders of infrastructure, care providers and policy makers should be included in the knowledge exchange process. Community initiatives are often precarious and, due to their reliance on securing short-term funding, difficult to sustain; a stronger evidence base demonstrating the outcomes of such initiatives could help support sustainability. One implication for research that arises from the review is the value of providing as full a description as possible of study participants, something that was lacking in many of the studies in this area.

Regarding day care provision, the review demonstrates the feasibility of providing nature-based day care through the green care farm model, offering a potential alternative to regular day care, and indicates that nature-based day care is also starting to emerge in different forms in urban areas. The evidence base for green care farms is relatively elaborated and could be translated to inform further development and innovation in day care provision, nationally and internationally. This could make nature-based activity more widely accessible, with adaptations for different contexts, cultures, and practices such as the use of rice farming in Japan [49] or new initiatives in urban areas [43].

In the case of interventions to address clinical need, outdoor nature-based activities can be conceptualised in one of two ways. They can be intended as general approaches to enriching people's experience and improving well-being that can contribute to reducing or preventing other problems; for example, exploring whether participation in an equine-assisted intervention reduces subsequent levels of "disruptive behaviour" in the day care setting [41]. Alternatively, activities can be designed to address specific clinical symptoms; for example, exploring whether an equine-

assisted intervention that includes riding the horse affects balance, agility, and muscle strength [60]. This kind of approach could potentially offer a more engaging alternative to standard physiotherapy exercises, with practice of relevant movements incorporated into an enjoyable activity taking account of personal interests and preferences. However, robust evidence of benefits relative to other treatment options or care arrangements is essential, and this review suggests that such an evidence base largely remains to be developed.

The studies included in the review capture activities that are varied in terms of their nature, content, frequency, and duration, and in terms of the resources required to provide them. Broadly, however, in these studies, engagement with nature mainly involves being active in the natural environment as part of a group in one way or another, whether by walking, working with plants, or interacting with animals. Although diverse, these activities do not necessarily constitute the full range of possible options, and there is considerable scope for innovation to expand the choices on offer, make these available to a wider range of people, evaluate their impact, and share the knowledge gained. Specifying the precise contribution that engaging in nature-based activity makes to well-being and health over time and to the trajectory of impairment in progressive conditions, however, would be a more complex undertaking requiring large samples, diverse activities, and long-term follow-up.

In summary, the review has highlighted three significant future research gaps. First, there is a need to extend involvement to people with dementia who are not attending or residing in formal care settings, and to address inequities in provision by including people from diverse backgrounds and circumstances, to ensure that those most in need have the opportunity to benefit. Second, there is scope to develop more innovative approaches encompassing a wider range of activities to suit different interests, preferences, and needs, and to identify solutions to some of the practical challenges of implementation. Third, unless the activity is intended to address specific clinical symptoms such as balance or gait, the main aim of developing and providing outdoor nature-based activities for people with dementia should be to promote inclusion, engagement, pleasure, and satisfaction among those participating. This means that the focus of change primarily rests with providers or potential providers, who may need to adapt both what they offer and how it is offered by making sites more accessible. Although there is growing awareness of this among businesses and other organisations that offer access to the natural environment, there is a need for evidence to support initiatives that address this gap [26, 80]. The wider ENLIVEN project aims to contribute to this much-needed organisational and business transformation by working with providers to develop and implement innovative approaches and evaluate the resulting organisational changes from multiple perspectives that may then be scaled up to make the natural environment more dementia-inclusive.

7. Conclusions

Access to outdoor nature-based activity for older people with dementia or other forms of cognitive impairment is not just a matter of good practice, but a fundamental right, currently denied to many [18]. This lack is all the more worrying as it restricts quality leisure time that could be used to enhance quality of life. This scoping review has identified pioneering research that reinforces this argument, reporting on the development, implementation, and evaluation of outdoor nature-based activity provision for people living with dementia, whether as an opportunity for meaningful and enjoyable occupation to enrich daily life, as a framework for the provision of day care, or as an intervention to address clinical needs. Our review of the extent and nature of the available evidence indicates that this is an emerging field of both practice and research. Mainstreaming access to outdoor nature-based activity to ensure it continues to be a part of everyday life for older people with dementia and other forms of cognitive impairment is a key challenge that must be overcome to ensure those who value it and find it beneficial do not have to negotiate key barriers to access. To achieve greater access and to expand the reach of nature for older people living with dementia and other forms of cognitive impairment, our findings reinforce the role of knowledge exchange among all parties involved as a basis for further development and evaluation. The natural environment remains an underutilised resource that could make positive contributions to the quality of life and well-being of older people with dementia and other forms of cognitive impairment. As a future area of both dementia practice and policy, this is set to grow in both significance and be recognised for the added value it can provide in addressing isolation and giving people agency in taking greater ownership of their own well-being and support.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon reasonable request.

Additional Points

What Is Known About This Topic. Older people with cognitive impairment may experience isolation and loneliness and lack opportunities for social contact or meaningful activity. Engaging with nature and the outdoor environment benefits well-being. Older people with cognitive impairment can potentially benefit from being able to get outdoors and connect with nature but experience significant barriers to access. *What This Paper Adds.* Research has focused mainly on including outdoor nature-based activity in day care provision. Few studies have evaluated community provision of outdoor nature-based activity, focusing mainly on equine-assisted interventions, walking groups, and adventure holidays. There is a need to develop and evaluate community provision of a wider range of outdoor nature-based activity for older people with cognitive impairment.

Disclosure

The protocol for the review is available online as a preprint. The views expressed are those of the authors and not necessarily those of the ESRC, UKRI, NIHR, the Department of Health and Social Care, or the National Health Service. For the purpose of open access, the author has applied a 'Creative Commons Attribution (CC BY) licence' to any Author Accepted Manuscript version arising.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

LC and RC conceptualised the review. RC, SO, KL, CO, JC, CQ, SPa, and LC developed the review protocol. RC and SO conducted literature searches. RC, SO, and SPr screened articles against inclusion criteria and extracted data, with LC and CO contributing to decisions about study selection. RC and LC drafted the manuscript, which was reviewed by SPa, JC, CO, CQ, SO and KL. Stephan Price is a co-first author.

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Supplementary Materials

The PRISMA checklist is available in supplementary material. (*Supplementary Materials*)

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