

Virtual Reality Horticultural Activities on the Physical and Psychological Outcomes of Older Adults: A Scoping Review

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Introduction

Population ageing is accelerating globally, and older adults frequently experience both physical decline and psychological burdens such as depression, anxiety, and loneliness, which diminish quality of life. Horticultural Activities (HA)—the purposeful use of plants and gardening in therapeutic programmes—have been shown to improve mood, reduce stress, and enhance physical and social functioning, underpinned by the Biophilia Hypothesis, Attention Restoration Theory, and Stress Reduction Theory. However, traditional HA is constrained by mobility limitations, weather, space, safety risks, and the physical demands of plant care, restricting access for frail or institutionalised older adults.

Virtual Reality (VR) has been proposed as a medium to deliver nature-based therapies while overcoming these barriers, simulating immersive horticultural experiences that are safe, repeatable, and adaptable. Yet evidence on Virtual Reality Horticultural Activities (VRHA) for older adults remains fragmented across heterogeneous study designs, interventions, and outcomes, and no review has systematically synthesised this literature.

Objectives

This scoping review mapped the existing evidence on VRHA for older adults aged 60 years and above. The specific objectives were to:

- Evaluate the reported effects of VRHA on physical and psychological outcomes;
- Identify the types and contents of VRHA interventions;
- Explore implementation strategies and research gaps to guide future studies and practice.



Methods

◆ Design

Scoping review following the JBI methodology and Arksey & O'Malley framework; reported per PRISMA-ScR. Protocol registered on OSF.

◆ Search

Five databases: Ovid, Scopus, PubMed, PsycINFO, Cochrane. Searched up to April 2025, plus backward citation searching.

Search terms combined three concepts:

Older adults & Horticultural activities; gardening & Virtual reality; technology

◆ Eligibility (PCC framework)

Population: adults aged ≥ 60 years

Concept: VR-based horticultural activities (participatory or observational; any level of immersion)

Context: healthcare, community, rehabilitation, or institutional settings

English-language primary studies only

◆ Selection & extraction

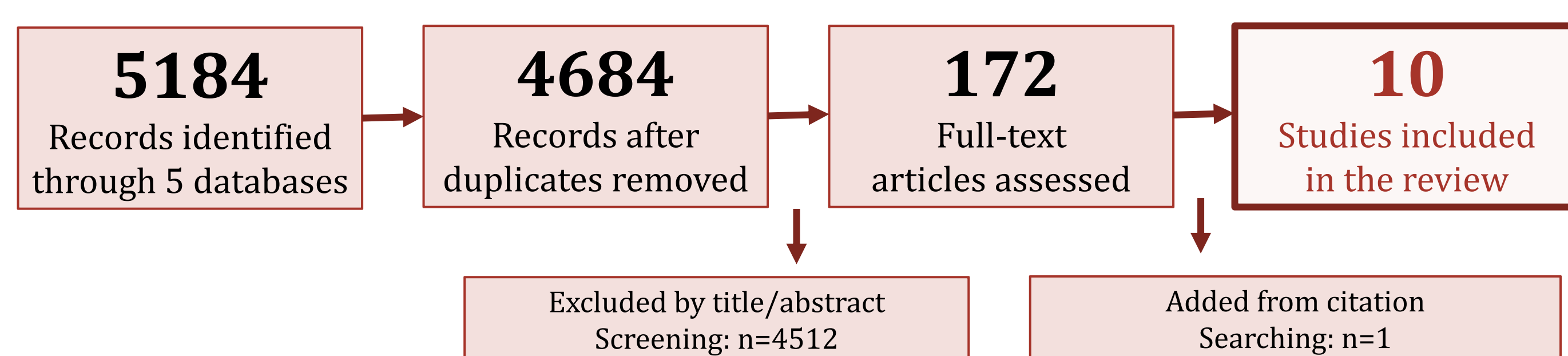
Titles, abstracts, and full texts screened independently by two reviewers; disagreements resolved by a third. Data extracted using a standardised form.

◆ Quality appraisal

Cochrane RoB 2.0 (RCTs) and MMAT 2018 (non-randomised studies). Findings synthesised narratively. No meta-analysis, given the heterogeneity of designs and outcomes.

Results

Study Selection (PRISMA-ScR)



Study & Intervention Overview

10 Studies		Setting	
RCT	4	Long-term care:	5
Quasi-experimental	3	Community:	5
Mixed methods	1	Intervention types & features	
Longitudinal	1	Immersion	Immersive HMD – 9 studies (HTC VIVE, Oculus, Pico Neo 3) Non-immersive screen – 1 study
Cross-sectional	1	Activity type	Participatory: planting, watering, harvesting Observational: 360 tours, scenery
623 Participants		Common features	Gamification, symbolic garden progression, relaxation cues Often integrated with hands-on
Gender	Female: 449 Male: 207	Dosage	20-120 min/session; 4-18 sessions Mostly therapist-facilitated group format
Mean age range: 68-88 years			
5 Countries			
Publication years: 2020-2025			

Outcomes Summary

	Psychological outcomes	Physical & functional outcomes
Increase / Improvement ↑	Mood, calmness & positivity Meaning in life & mattering	Global cognition, memory, executive function Mobility & daily activities (Barthel, TUG) Autonomic balance (heart-rate variability) Physical engagement & social function
Reduction ↓	Depression (GDS) Anxiety (HADS) Loneliness & isolation	BPSD (agitation, aggression)
Remarks	*General psychological well-being: mixed findings	*Effect sizes small-to-moderate where reported

Implementation & Safety

≤16% Cybersickness (minimal)	0 Serious adverse events	1-25% Attrition (illness, motivation)	Yes Facilitator Support advised
Findings show POTENTIAL , not proven effects studies were small, heterogeneous and varied in quantity			

Outcomes Mapping and Quality Appraisal

Study	Outcomes Mapping						Quality Appraisal	
	Depression	Anxiety	Loneliness / social	Cognition	Mobility/ ADL	BPSD	RCTs	Non-randomised
Cieslik et al (2023)	✓	✓						
Gutman et al (2021)						✓	Some concerns	
Szczepanska-G. et al (2021)	✓						Some concerns	
Chuang et al (2025)				✓	✓		Some concerns	
Eisapour et al (2020)					✓		Non-randomised	Low risk
Fan et al (2022)	✓		✓					Low risk
Lin et al (2020)			✓					Low risk
Kalantari et al (2022)	✓							Low risk
Huang (2021)								Some concerns
Li et al (2024)					✓			High risk of bias

Quality varied; some common issues include small samples, limited randomization, few active controls.

Conclusions and Contributions

- This scoping review provides the first systematic mapping of VRHA for older adults, indicating that it shows promise for enhancing psychological well-being and functional abilities.
- VRHA is generally feasible and safe to deliver, and may extend nature-based therapy to frail, institutionalised, or urban older adults with limited access to real gardens.
- The evidence base remains at an early, exploratory stage, characterised by heterogeneous interventions and methodological limitations.
- Future research should prioritise standardised VRHA protocols and rigorously designed randomised controlled trials to isolate the specific therapeutic effects of VRHA and evaluate long-term outcomes.

Trial Information & Reference

- Trial Registration: Open Science Framework: <https://doi.org/10.17605/OSF.IO/62TF7>
- Arksey H, O'Malley L. Scoping studies: towards a methodological framework. International Journal of Social Research Methodology. 2005;8(1):19-32. doi:10.1080/1364557032000119616.2.