Immersive virtual reality gardening training in older adults with and without early dementia C.Y. Wu, I.C. Chuang, K.H. Su. *Gerontechnology* 25(s*)*

Purpose Cognitive decline in aging is a major health concern, reducing independence and quality of life. Immersive virtual reality (VR) has been shown to improve engagement and cognitive performance in older adults with or without mild cognitive impairment [1, 2]. However, limited research has examined the integration of VR-based cognitive training with meaningful leisure activities, such as gardening, that are culturally familiar and motivating for older adults [3]. This pilot study aimed to address this gap by evaluating the feasibility, usability, and preliminary cognitive outcomes of a gardening-based VR training program for community-dwelling healthy older adults and older adults with early dementia (EDM). **Method** Twenty older adults (Health: n=10; EDM: n=10) participated. The two groups did not differ significantly in age, gender, or education (all $p > .05$), but baseline MoCA scores were significantly lower in the EDM group (Health = 25.3 ± 3.2; EDM = 14.1 ± 4.2; $p < .001$). The VR gardening program, developed by our team, involved immersive tasks such as planting, watering, and harvesting using hand-tracked interactions in a 360-degree virtual garden. The intervention comprised 16 sessions over 8 weeks (twice weekly, 1 hour each). Feasibility (perceived usefulness, intention to use, subjective norms) and usability (ease of use, enjoyment, user experience) were assessed via standardized scales (1–5 range). Cognitive outcomes were measured pre- and post-training using the Montreal Cognitive Assessment (MoCA) [4], Stroop Color-Word Test [5], and Color Trails Test (CTT) [6]. Data normality was confirmed via the Shapiro-Wilk test ($p > .05$), justifying the use of independent-samples t-tests for group comparisons and two-way repeated-measures ANOVA for cognitive outcomes. **Results and Discussion** All participants completed the training with no adverse events, demonstrating excellent feasibility and usability (Table 1). While both groups showed strong acceptance, healthy participants reported significantly higher ratings for perceived usefulness, intention to use, enjoyment, and user experience (all $p < .05$). Two-way ANOVA revealed significant main effects for group and time on MoCA scores, with no interaction, indicating comparable cognitive improvement across both groups. Specifically, MoCA scores improved significantly in both the Health (25.3 to 27.6) and EDM (14.1 to 16.1) groups ($p < .05$)(Figure.1). Changes in Stroop and CTT were nonsignificant. These results suggest that Immersive VR gardening training is a feasible and cognitively beneficial intervention. The culturally relevant gardening context may enhance motivation and support cognitive stimulation even in early dementia. Future large-scale randomized controlled trials are warranted to confirm these neural mechanisms.

References

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Table 1. Results of the post-training acceptance questionnaire assessing the feasibility and usability of the healthy older adults (Health) and early dementia (EDM). The scores are presented as mean and standard deviation.

	Health	EDM	P value
Feasibility subscale			
Perceived usefulness	4.57(0.45)	3.70(0.79)	<0.05
Intention to use	4.30(0.54)	3.40(0.46)	<0.05
Subjective norms	3.73(0.56)	3.67(0.38)	0.761
Usability subscale			
Perceived ease of use	4.00(0.47)	3.50(0.97)	0.16
Perceived enjoyment	4.53(0.59)	3.63(0.37)	<0.05
User experience	4.43(0.39)	3.70(0.43)	<0.05

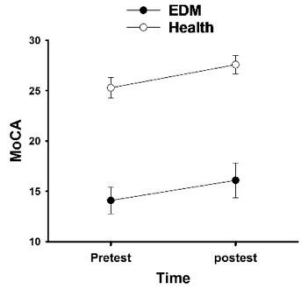

Figure 1: Changes in MoCA from pretest to posttest for healthy older adults (Health) and early dementia (EDM).