

A Multidomain Mobile Intervention for Mild Cognitive Impairment



Yeo Jin Kim^{1,2}, Yerim Kim¹, Byoung-Kwon Lee³, Sang-Kyu Lee⁴, Moo-Eob Ahn⁵

¹Department of Neurology, Kangdong Sacred Heart Hospital, Seoul, Korea, ²Ezcob.lab Inc., Chuncheon, Korea, ³UBIPLUS Co., Ltd, Chuncheon, Korea, ⁴Department of Psychiatry, Chucheon Sacred Heart Hospital, Chuncheon, Korea, ⁵Department of Emergency Medicine, Chuncheon Sacred Heart Hospital, Chuncheon, Korea

This pilot trial demonstrated the feasibility of a mobile multidomain intervention for MCI and identified engagement as the key barrier to cognitive benefit.

❖ Introduction

Multidomain nonpharmacological interventions that combine physical activity and cognitive training are promising for treating mild cognitive impairment (MCI).

However, real-world engagement and attrition may substantially reduce the delivered dose and constrain measurable benefits.

This pilot randomized controlled trial evaluated the feasibility of a home-based multidomain mobile intervention for MCI, quantified engagement using objective app logs, and explored preliminary clinical outcomes compared with an active control mobile intervention.

❖ Methods

This 12-week, assessor-blinded, two-arm randomized controlled trial recruited patients with MCI from a memory clinic in the Republic of Korea between December 2022 and March 2023.

Participants were randomized 1:1 to either a multidomain mobile intervention combining app-based physical activity plus cognitive training and a memory diary, or an active control mobile intervention comprising the same app-based physical activity only.

The primary clinical outcome was the baseline-adjusted week-12 Alzheimer's Disease Assessment Scale-Cognitive Subscale 13-item score.

Engagement and adherence were quantified using app log metrics, and postintervention telephone interviews were conducted to assess usability barriers and acceptability.

❖ Results

Table 1. Participant baseline characteristics

	Total	Multidomain group (n=9)	Control group (n=11)	p value
Age (years), mean (SD)	74.8 (7.71)	75.4 (7.86)	74.2 (7.92)	.726
Female, n (%)	16 (80)	8 (88.9)	8 (72.7)	.591 ^a
Education (years), mean (SD)	8.9 (3.74)	8.2 (3.03)	9.5 (4.30)	.478
ADAS-Cog 13 total score, mean (SD)	25.3 (6.68)	28.8 (5.72)	22.4 (6.19)	.028
K-MMSE-2 total score, mean (SD)	25.0 (3.49)	23.4 (3.97)	26.3 (2.57)	.070
CDR global score, median (min-max)	0.5 (0-0.5)	0.5 (0.5-0.5)	0.5 (0-0.5)	.503 ^b
CDR sum of boxes, median (min-max)	0.5 (0-1.5)	0.5 (0.5-1.5)	0.5 (0-1.5)	.503 ^b

^a Fisher exact test was used because 2 cells had expected counts <5. ^b Mann-Whitney U test was used because the variable was not normally distributed.

Table 2. Dose-response associations between app use and outcomes

	Total app time		Exercise time	
	β (95% CI)	p value	β (95% CI)	p value
ADAS-Cog 13 total	0.37 (-1.38, 2.03)	0.708	0.38 (-1.36, 1.94)	0.670
K-MMSE-2	0.37 (0.08, 0.64)	0.034	0.37 (0.08, 0.61)	0.021
CDR-SB	0.04 (-0.06, 0.10)	0.428	0.04 (-0.05, 0.11)	0.364
ADCS-ADL-MCI	1.14 (0.26, 2.53)	0.030	1.01 (0.38, 1.85)	0.037

Linear regression models pooled both groups and adjusted for baseline outcome and randomized group. App use was log-transformed; 95% CIs were estimated by bootstrap resampling.

Table 3. App engagement and protocol adherence over 12 weeks

	Overall	Multidomain group	Control group	p value
Total time (min)	64.3 [24.9, 209.5]	67.4 [39.5, 67.9]	40.3 [17.5, 269.7]	0.595
Active day (count)	8 [2, 17]	10 [3, 14]	6 [2, 34]	0.909
Exercise time (min)	22.6 [4.6, 92.5]	34.4 [4.9, 42.0]	17.7 [4.9, 261.8]	0.819
Cognitive training time (min)	NA	21.4 [8.7, 72.7]	NA	
Weeks with ≥5 active days (count)	0 [0, 1]	0 [0, 1]	0 [0, 3]	0.438
Non-zero weekly adherence, n (%)	8/20 (40.0%)	3/9 (33.3%)	5/11 (45.5%)	0.67

Values are median [IQR] unless otherwise stated. Total active time was estimated from in-app log timestamps, with each interval capped at 5 minutes. Active day was defined as any day with ≥1 log event. Non-zero weekly adherence indicates ≥5 active days in at least one week.

❖ Conclusion

This pilot randomized trial supports the feasibility of a mobile multidomain intervention for MCI.

Although no significant group-level cognitive benefit was observed at 12 weeks, greater app use—particularly exercise engagement—was associated with better cognitive and functional outcomes.

Improving adherence may be essential for future mobile multidomain interventions in MCI.

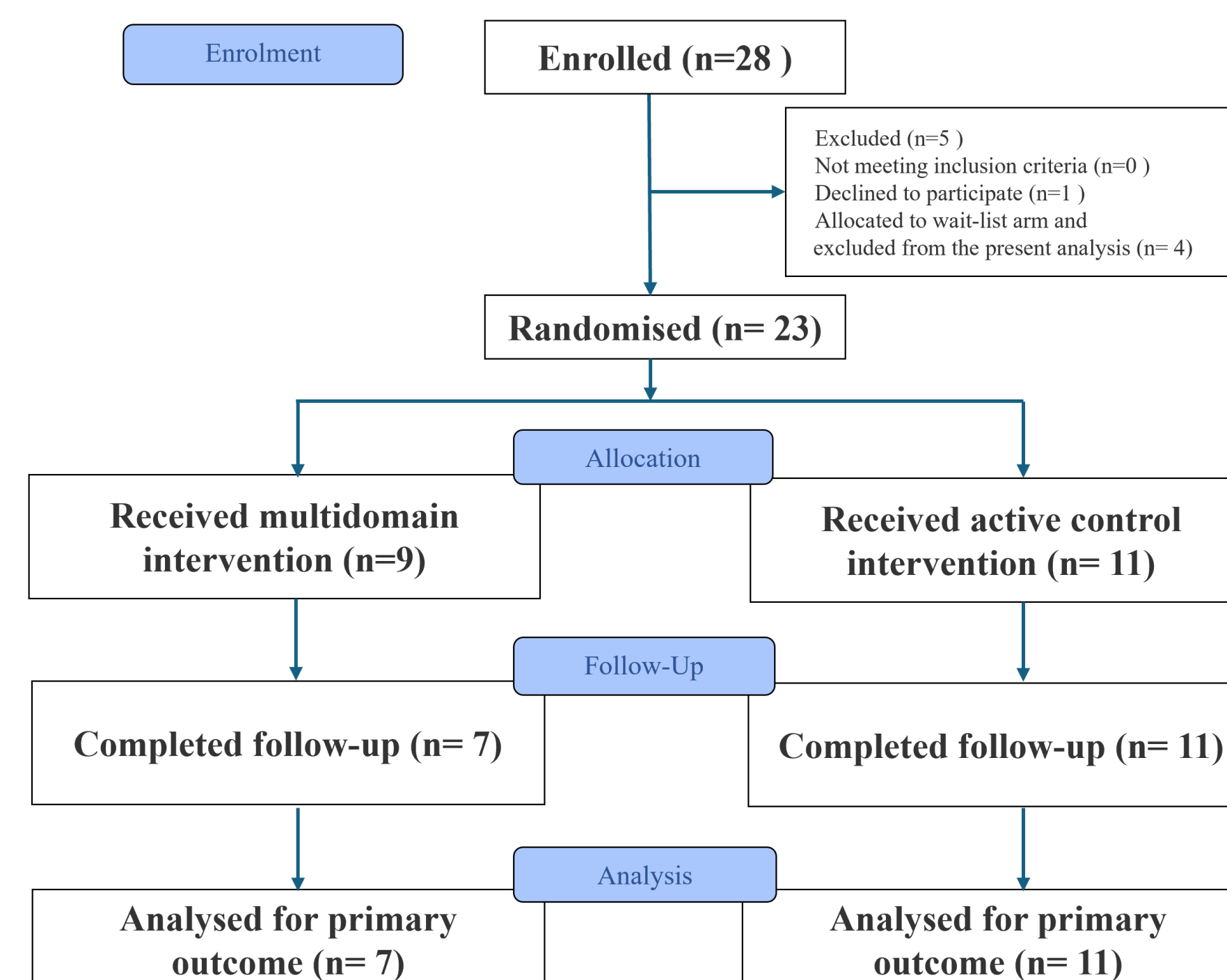


Figure 1. Flow chart of the pilot randomized controlled trial