A Digital Reminiscence Intervention Program Using a Time-Traveling Road Map for Community-Dwelling Elderly with Mild Cognitive Impairment: A Pilot Study

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Abstract

Background: Mild Cognitive Impairment is a prevalent concern among the aging Korean population, with an urgent need for non-pharmacological interventions as a result of the lack of effective treatments.

Objective: This pilot study aimed to evaluate the effects of a Roadmap Time-Traveling Intervention program, a digital reminiscence therapy intervention, on cognition, communication, and mood in older adults with Mild Cognitive Impairment.

Methods: Fifty participants were randomly assigned to either the experimental or control group. Cognitive function, communication difficulties, quality of life, depression, and anxiety were assessed at baseline (T0), immediately after the intervention (T1), and four weeks post-intervention (T2). Generalized estimation equations were utilized to analyze the program's effectiveness over time (T0-T1) between groups. Repeated measures analysis of variance or the Friedman/Wilcoxon signed-rank tests were employed to examine changes across the three time points (T0-T1-T2) within the experimental group. The study followed the Consolidated Standards of Reporting Trials guidelines.

Results: The experimental group exhibited significant improvements in cognitive function ($p < .001$) and quality of life ($p < .001$) compared to the control group. Within the experimental group, cognitive function ($?^2 = 9.55$, $p = .008$), communication difficulties ($?^2 = 8.57$, $p = .014$), and quality of life ($?^2 = 3.35$, $p = .046$) improved significantly across the three time points (T0-T1-T2).

Conclusions: The Roadmap Time-Traveling Intervention program, as a non-pharmacological digital reminiscence therapy intervention, demonstrated efficacy in enhancing cognitive function, reducing communication difficulties, and enhancing the quality of life in older adults with MCI. This program holds promises for broader implementation in community settings for elderly individuals with MCI.

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Keywords: Mild Cognitive Impairment; Quality of Life; Cognitive function; Digital Reminiscence Theory; Non-pharmacological intervention; Community-dwelling elderly

Introduction

Mild Cognitive Impairment (MCI), a common condition associated with aging, represents an intermediate stage between normal cognitive aging and dementia [1]. In 2021, the prevalence of MCI was reported at 22.7% among elderly individuals aged 65 and older in South Korea[2].Older adults with MCI often experience memory loss, as well as declines in cognitive functions such as intelligence, speech, and learning abilities [1].These cognitive challenges impair their ability to perform daily activities, significantly reducing their quality of life (QoL) and contributing to psychological challenges, including communication difficulties and compromised mental well-being [1].While MCI primarily affects the individual, its impact extends to family members and carries broader societal and economic implications [3]. In the absence of effective treatments, the development of non-pharmacological interventions is crucial to prevent further cognitive decline [4].

Reminiscence therapy (RT), a non-pharmacological intervention, has exhibited promise in treating individuals with cognitive impairments [5]. Research suggests that RT may improve neuropsychological factors such as cognitive improvements and memory recall [5, 6], as well as enhance verbal fluency, stimulate mental activity, and improve wellbeing [8, 9] in individuals with dementia under certain conditions [5]. Given that older adults with MCI often retain better memories of distant events than recent ones, RT may be particularly suitable for this population.

However, most prior RT intervention studies have focused on patients diagnosed with dementia, aiming to enhance cognitive functions [3, 10, 11]. Consequently, there is limited research on the effectiveness of RT intervention specifically targeting individuals with MCI. Traditional RT methods used in cognitive enhancement programs typically involve music, art, and photographs [11, 12]. In contrast, life review RT involves the intentional or unintentional recall of personal memories, often utilizing sensory stimuli such as videos, photographs, and household objects from the past. This approach often results in the creation of a life storybook, evoking memories and emotions [12, 13].

Recently, digital reminiscence has gained interest [10, 13], incorporating advanced information and communication technologies (ICTs) such as webcams, digital photos, computer graphics, and personalized videos [3, 14]. This allows individuals with cognitive impairments and their caregivers to engage with digital content tailored to evoke participant-specific memories [15]. However, there is limited evidence on the effectiveness of digital RT in older adults with MCI. Given the scarcity of integrated technological approaches in existing cognitive enhancement programs, there is a need to develop innovative interventions that incorporate both scientific and technological advancements.

In response to this need, we developed the Roadmap Time-Traveling Intervention (RMTI) program, a non-pharmacologic digital RT intervention. This program utilizes a freely available online roadmap and prompts community-dwelling elderly individuals with MCI to reminisce about past experiences through visual and spatial stimulation. This study represents a novel attempt to integrate technology into cognitive enhancement programs and aims to evaluate the program's effects on cognition, communication, and mood.

We hypothesized that older adults with MCI who participated in the RMTI program would exhibit greater improvements in cognitive function, QoL, and communication, along with reductions in depression and anxiety, compared to those who did not participate in the program.

Methods

Study design

This pilot study employed anon-equivalent, controlled trial design to evaluate between-group and within-group changes. Parallel group randomization was conducted with an allocation ratio of 1:1. The study adhered to Consolidated Standards of Reporting Trials(CONSORT) guidelines and was approved by the Institutional Review Board of S University (No.SSWUIRB-2020-021). Participants were assured of confidentiality and anonymity. After the objectives and participant rights were explained, informed consent was obtained.

Setting and sampling

Participants were recruited from the community, specifically from senior centers in a district of Seoul, Korea. Out of 96 senior centers, 10 were selected based on accessibility, and seven centers were excluded as a result of insufficient registered participants, leaving three centers. The inclusion criteria wereage≥65 years, diagnosed with MCI (20≤Mini Mental State Examination score-K (MMS-K) <24), and able to communicate and hear. Exclusion criteria included progressing dementia [The Korean version of the Mini-Mental State Examination (MMSE-K) <20], normal cognitive function (MMSE-K≥24), recent onset of psychological or neurological disorders affecting cognition; and cognitive or psychological treatment within the past three months.

The sample size was calculated utilizing the G*Power 3.1.9.7 program (Düsseldorf, Germany) for repeated-measures analysis of variance (ANOVA), with the significance level (α) being set at 0.05, a desired statistical power (1 −β) of 0.95, and an effect size (f) of 0.27. This study included two groups and three measurement points. The effect size utilized for sample size calculation was based on similar health interventions for older adults (KCT0003446) [3]. The minimum sample size required was 36 participants (18 per group). Considering the high dropout rates in elderly populations, 50 participants (25 per group) were recruited. After screening 68 participants, 18 were excluded for having progressed to dementia (MMSE-K≥24). The remaining 50 participants were equally into experimental and control groups using a random number table by an independent allocator. The final study population, after attrition (n = 7), included 46 participants: 20 in the experimental group and 24 in the control group.

Surveys were administered at baseline (T0) and post-intervention (T1) in both groups. In the experimental group, a repeated-measures design was used with three time points: T0, T1, and T2 (four weeks after the intervention). To maintain therapy quality, trained nurses followed a standardized manual for the RMTI program. The control group continued usual activities until T1, after which they received a short RMTI program (see Figure1).

Develop of the Road Map Traveling Intervention (RMTI) program

The RMTI program was developed for older adults with MCI based on Life Review Theory [16], which is rooted in Erikson's psychosocial developmental theory [17]. This theory posits that recalling personal memories positively influences cognitive abilities related to time, individuals, and space.

The program was based on a systematic literature review and designed to progressively evoke memories and emotions [18]. Sessions lasted 60-90minutes, twice a week, for six weeks (12 sessions in total), based on prior research [19, 20]. The program was validated by a multidisciplinary team, including experts in dementia, geriatric nursing, IT, and community health.

One trained nurse conducted the RMTI with two or three participants in each group. The sessions were divided into three parts. Initially, in pairs, the first five minutes were devoted to introducing the theme of the day's sessions. The following 45 minutes involved small-group activities designed to stimulate cognitive function and encourage social interactions that contributed to psychosocial well-being. Trained nurses, utilizing tablet PCs, accessed an online map available for free on the DAUM portal site [21], which included current and past road views from the last five years (see Figure 2). They entered participants' addresses related to significant life events, such as prior residences, hometowns, and workplaces. With questions prepared for each session, the nurses guided and encouraged the participants to recall forgotten yet impactful past experiences, relating them to relevant images to enhance the recollection process. Participants focused on specific periods (e.g., childhood, school years, and work life), highlighting relevant individuals, locations, and events. They took turns sharing their experiences with other group members to foster interaction and address communication difficulties. The final 10 minutes were dedicated to concluding the session and facilitating social interaction. In total, each complete session lasted 60 minutes, requiring 90 minutes for three participants.
A detailed description of intervention is described in Table 1.

Table 1. Roadmap Time-Travelling Intervention Program

Session	Contents	Prepared Open questions
1	Orientation Program Information &The current residential district	•Where is the current residential district? •Who is the current co-resident? •How long have you been living in current neighborhood? •What is the notable feature in one's home or the neighborhood?(Such as significant markets, parks, etc.)
2	In one's place of origin or birth	•Where is your hometown? •How long have you been living there? • Tell me what you remember about that place (house, neighborhood streets, surroundings, etc.)
3	The place where one grew up	• Where did you live during childhood? •What memories do you have? (Including the atmosphere, people around, etc.) • Until what age did you live? •Do you remember anyone close neighborhood or friends
4	The place where one primarily lived during childhood.	•Where did you live for the longest time during your childhood? (If the answer is the same as the 3rd session, proceed with a follow-up question)
5	The noteworthy school 1	•Could you share your experiences during your school days? •Where was the school located? •Could you share memories or stories about close friends, teachers, or notable events from your school days? (If there was no formal schooling, maintain the conversation focusing on relationships with friends and significant life events during adolescence)

6	The noteworthy school 2	•Could you share your experiences during your school days? •Where was the school located? •Could you share memories or stories about close friends, teachers, or notable events from your school days? (If there was no formal schooling, maintain the conversation focusing on relationships with friends and significant life events during adolescence)
7	The initial workplace 1	•Where was your first/second workplace? •What kind of job were you engaged in? (If there was no job, main the conversation focusing on place where the participants first lived or remembered)
8	The initial workplace 2	•Where was your first/second workplace? •What kind of job were you engaged in? (If there was no job, main the conversation focusing on place where the participants first lived or remembered)
9	The place where one's closest friend lived	•Where did your closest friend live? •Do you have experience of visiting your friend's house? •Which place did you mainly play with your friend?
10	Memorable place traveled 1	•Where is the memorial place that you traveled? •(seeing screen together)Who did you go with? What did you do? •Have you visited there before?
11	Memorable place traveled 2	•Where is the memorial place that you traveled? •(seeing screen together)Who did you go with? What did you do? •Have you visited there before?
12	The place desired to visit &Finalization	•Where is the top desired place you want to go? •Why did you want to go?

Training nurses

Four registered nurses specializing in geriatric care received additional training for conducting the RMTI sessions. Training included using online maps, guiding participants through open-ended questions, and facilitating group discussions while ensuring neutral engagement. The nurses also received instruction on screening MCI using the MMSE-K and conducting pre- and post-intervention surveys. A standardized manual ensured uniform delivery of the intervention.

Screening MCI utilizes MMSE-Kas well as surveying pre and post questionnaires which were also included in the training.

Measurements

Self-report questionnaires were developed to collect information on demographic and neuropsychological factors. The demographic items included age, sex, education level, past and present occupations, living arrangements, and comorbidities. The authors assessed comorbid conditions utilizing the Charlson Comorbidity Index (CCI) [22], which offers a straightforward and reliable method for estimating the burden of comorbid diseases.

Cognitive function

This study employed MMSE-K was utilized to assess cognitive functions. Originally developed by Folstein et al. [23], it was translated into Korean by Park and Kwon [24] considering the high illiteracy rates among the elderly population in Korea. The assessment covered various cognitive domains, including time orientation (5 points), spatial orientation (5 points), memory registration (3 points), attention and calculation (5 points), memory recall (3 points), language (7 points), and space-time configuration (2 points). Additionally, to accommodate participants with low educational backgrounds, extra points were awarded: one point for time orientation, two points for attention and calculation, and one point for language. The total score ranges from 0 to 30, with lower scores indicating more severe cognitive impairments. Scores are categorized as follows: MMSE-K ≥ 24 indicates normal cognition, 20 ≤ MMSE-K < 24 indicates MCI, and MMSE-K < 20 suggests dementia.

Quality of life

The Korean Version of the QoL-Alzheimer's Disease (KQoL-AD) scale was utilized to assess QoL [25]. This instrument is a translated version of the original QoL in Alzheimer's Disease (QoL-AD) scale developed as a disease-specific measure by Logsdon et al. [26]. The K-QoL-AD consists of a 13-item questionnaire that evaluates various aspects, including participants' physical health, mood, relationships, activities, and ability to perform tasks, utilizing a 4-point Likert scale (poor, fair, good, or excellent). Total scores ranged from 13 to 52, with higher scores reflecting a better QoL. The questionnaire had a Cronbach's alpha of 0.80, indicating good internal consistency.

Communication difficulties

Communication difficulties were assessed utilizing The Holden Communication Scale (HCS) [27], which was translated by Kim [28]. This scale consists of 12 items that evaluate aspects of conversation skills, awareness, and knowledge related to communication. Respondents rated their experiences on a five-point scale (0–4), resulting in a total score of 0–48. A lower score indicated a greater ability to communicate. The questionnaire had a Cronbach's alpha of 0.85, indicating a strong internal consistency.

Depression

Depression was assessed utilizing the Korean version of the Geriatric Depression Scale (K-GDS) [29], which is a translation of the original Geriatric Depression Scale (GDS) [30]. This self-report instrument consisted of 30 items designed to evaluate the severity of depressive symptoms in older adults. The scores range from 0 to 30, with higher scores indicating greater levels of depression. The K-GDS demonstrated a Cronbach's alpha of 0.78, indicating adequate internal consistency.

Anxiety

Anxiety was assessed utilizing the Korean version of the Geriatric Anxiety Inventory (K-GAI) [31], which is a translation of the original Geriatric Anxiety Inventory (GAI) [32]. The K-GAI comprises 20 questions designed to evaluate the severity of anxiety symptoms in older adults, with responses scored as “yes” (1 point) or “no” (0 points). Total scores ranged from 0 to 20, with higher scores indicating greater anxiety. The K-GAI had a Cronbach’s alpha of 0.89, indicating strong internal consistency.

Data analysis

All statistical analyses were conducted utilizing the SPSS software (version 23.0; IBM Corp., Armonk, NY, USA). Descriptive data were analyzed utilizing means and frequencies. The normality of the independent variables was assessed utilizing the Shapiro-Wilk test. Chi-squared, Fisher’s exact, and Mann-Whitney U tests were utilized to evaluate the baseline characteristics between the experimental and control groups. As the independent variables did not meet the assumptions of normality, sphericity, or homogeneity of variance, generalized estimating equations (GEE) were utilized to assess the effects of the RMTI program over time (T0-T1), adjusting for covariates such as age and education. Within the experimental group, repeated-measures ANOVA, Friedman test, or Wilcoxon signed-rank test was applied to examine changes in independent variables across the three time points (T0-T1-T2).

Results

Homogeneity of general characteristics and dependent variables

Baseline characteristics exhibited no significant disparities between the control group and experiment group except age (Z=-2.52, p=.012) and education level (χ^2=7.94, p=.019). Among the baseline clinical measurements, cognitive function, quality of life, depression, and anxiety did not differ significantly between the control group and experiment group, whereas communication difficulty (Z=-4.07, P<.001)was higher in the experiment group (Table 2).

Table 2. General Characteristics and Homogeneity

	Exp.(n=20) Mean±SD, n(%)	Cont.(n=24) Mean±SD, n(%)	χ^2/Z	*p*
Age, years*	78.57±7.29	74.04±5.52	-2.52	.012
60-69†	4(20.0)	5(20.8)	8.33	.016
70-79	4(20.0)	14(58.4)		
≥80	12(60.0)	5(20.8)		
Female	12(60.0)	17(70.8)	0.78	.377
Education				
≤Elementary	12(60.0)	5(20.8)	7.94	.019
Middle school	4(20.0)	8(33.3)		
≥High school	4(20.0)	11(45.8)		
Past occupation				

None	8(40.0)	5(20.8)	2.30	.552
White collar	9(45.0)	13(54.2)		
Blue collar	1(5.0)	4(16.7)		
Agriculture	2(10.0)	2(8.3)		
Present occupation (No)†	20(100)	22(91.7)	1.66	.495
Live alone (Yes)†	4(20.0)	7(29.2)	1.06	.470
Charlson Comorbidity Index*	5.26±1.48	5.08±1.31	-0.27	.781
Hypertension (Yes)	8(40.0)	13(54.2)	1.27	.755
Cholesterol (Yes)	2(10.0)	8(33.3)	3.09	.079
Baseline dependent variables				
Cognitive function	21.10±1.88	20.70±0.80	-1.62	.105
Communication difficulty	45.31±4.34	40.20±3.81	-4.07	<.001
Quality of life	30.47±5.32	28.29±3.15	-1.35	.175
Depression	12.42±6.37	12.66±5.39	-0.44	.658
Anxiety	3.68±5.46	4.41±3.70	-1.41	.156

Exp.=Experimental group; Cont.=Control group; †Fisher's Exact test

The effect of the Road Map Traveling Intervention (RMTI) program between experimental and control group

The effect of the RMTI program between the two groups is exhibited in Table 3.
Cognitive function was significantly increased in the experimental group compared with the control group at T1. The results for group (p<.001), time (p=.004), and group × time (p<.001) were significant.
Communication difficulty did not exhibit a significant difference between group × time(p=.851); however, there was a significant disparity between the groups (p<.001).
QoL significantly increased in the experimental group compared to the control group at T1. The findings for the group (p=.015) and group × time (p<.001) were significant.
Depression (p=.580) and anxiety (p=.803) were not significantly different between the groups.

Changes in dependent variables over time points in the experimental group

Changes in the dependent variables from baseline to endpoint in the experimental group are exhibited in Table 4. Cognitive function (χ^2=9.55, p=.008), communication difficulty (χ^2=8.57, p=.014), and QoL (χ^2=3.35, p=.046) exhibited significant disparities over three time points (T0-T1-T2). Cognitive function significantly increased between T0 and T1 (p<.01) and between T0 and T2 (p<.01), respectively. Communication significantly decreased between T0 and T 2 (p<.05) and between T 1 and T 2 (p<.5). The QoL significantly increased between T0 and T1 (p<.05) (Figure 3).

Table 3. Effect of the Road Map Time Travel Program Between Groups

		T0	T1	Sources†	Wald χ^2	*p*
		EM Mean±SE	EM Mean±SE			
Cognitive function	Exp.	20.95±18.40	23.81±21.12	Group	14.97	<.001
	Cont.	20.83±18.54	20.56±18.30	Time	8.35	.004
				Group*Time	12.57	<.001
Communication difficulty	Exp.	45.64±51.33	44.43±50.05	Group	17.47	<.001
	Cont.	39.96±45.57	38.64±44.17	Time	2.98	.084
				Group*Time	0.01	.851
Quality of life	Exp.	30.19±50.27	32.29±50.12	Group	5.94	.015
	Cont.	28.51±51.07	26.88±51.14	Time	0.23	.629
				Group*Time	14.04	<.001
Depression	Exp.	13.88±77.66	14.51±81.28	Group	0.73	.393
	Cont.	11.50±65.27	13.39±75.78	Time	1.45	.228
				Group*Time	0.43	.508
Anxiety	Exp.	6.44±53.68	6.93±57.61	Group	1.52	.217
	Cont.	5.11±42.94	5.17±43.39	Time	0.12	.725
				Group*Time	0.06	.803

Exp.=Experimental group (n=20); Cont.=Control group(n=24); EM=Estimation marginal; SE=Standard Error; T0=Before intervention; T1=Post-intervention;
†General Estimating Equation;
Group*Time=Interaction between group and time;

Table 4. Changes in Dependent Variables Over Time in the Experimental Group (n=20)

	T0-T1	T0-T2	T1-T2	F/χ^2	*p*
	Mean Diff.(SE)	Mean Diff.(SE)	Mean Diff.(SE)		
Cognitive function†	-2.89(0.80)**	-2.47(0.84)**	0.42(0.89)	9.55	.008
Communication difficulty†	1.21(1.54)	3.52(1.44)*	2.31(0.78)*	8.57	.014
Quality of life	-2.15(0.90)*	-2.19(1.11)	0.05(0.87)	3.35	.046
Depression	-1.36(2.10)	2.05(1.29)	3.42(1.85)	1.85	.171
Anxiety†	-1.05(1.01)	-0.78(1.04)	0.26(0.39)	0.04	.979

*<.05; **<.01; †Friedman test and Wilcoxon signed rank test
T0=Before intervention; T1=Post-intervention; T2=4 week after intervention;
Mean Diff.=Mean Difference; SE=Standard Error

Discussion

In this study, we investigated whether the RMTI program, a non-pharmacological digital RT intervention program utilizing an online road map, could stimulate cognitive function, promote social interaction, and improve psychosocial well-being in elderly individuals with MCI. Results exhibited that participants who received the RMTI program demonstrated significant improvements in cognitive function over time, both immediately post-intervention and at a 4-week follow-up, compared to those who did not receive the program. These findings suggest that the RMTI program was effective not only in enhancing cognitive function immediately post-intervention but also in sustaining these improvements for more than four weeks. This outcome aligns with previous studies, such as one involving reminiscence therapy through traditional games led by visiting nurses for elderly individuals with MCI, which also reported immediate cognitive improvement post-intervention[33]. Prior research has exhibited mixed results regarding the cognitive benefits of RT, particularly in group settings. However, in our community study, a person-centered RMTI program conducted by trained nurses focused on searching for the locations of important life events utilizing an online road map with a road view function, reviewing the participants' specific life processes, and stimulating visual as well as auditory processes [15]. After approaching participants individually, group interactions followed, which could also have been attributed to the immediate improvement in cognitive function, which continued to improve for more than four weeks post-intervention among older adults with MCI. Although prior studies have stressed the importance of the individual setting in enhancing cognitive function, combining group interactions might also affect cognitive function. Older adults with MCI may struggle to express emotions and recall memories from their youth, which can hinder their ability to maintain a clear sense of personal identity as a result of the gaps in autobiographical memory. From a cognitive perspective, both autobiographical memory and communication skills are crucial factors to consider [15]. In this study, the authors were convinced that a critical factor in the success of the intervention was the presence of a trained nurse who utilized a standardized manual to facilitate and encourage communication and interaction among participants in an attempt to remedy the challenges [34]. Questions were prepared for each session and functioned as memory triggers for better reminiscence, which may have enhanced cognitive function. By connecting with the individual's cognitive strengths, communication can be enhanced, enabling them to confidently share their past experiences and life events with trained nurses and group members [35].

Prior research on computerized cognitive stimulation programs in elderly adults with MCI reported that the MMSE score improved immediately post the course of treatment, but not three months later, however, other cognitive measures, such as categorical verbal fluency, were significantly higher scores during the three-month follow-up period [6]. Therefore, further research is needed with more varied cognitive measurements and larger sample sizes, as this study might not be clear enough to be important.

Elderly individuals with MCI who participated in the RMTI program did not exhibit immediate improvements in communication difficulties compared to those who did not participate. However, within the group that received the RMTI program, communication difficulties significantly improved by four weeks post-intervention compared to baseline. A prior randomized controlled trial (RCT)involving patients with dementia reported that a four-

week, eight-session digital RT program, which utilized personal materials to trigger memories, effectively enhanced participants' engagement [3]. In this study, elderly individuals with MCI shared specific life episodes that were facilitated by trained nurses in individual sessions and later discussed them in a group setting, promoting social interaction. Although the six-week, 12-session RMTI program may have strengthened social interaction, it did not result in an immediate positive effect on communication. To the best of our knowledge, no other studies have directly examined this combination of individual and group RT approaches. A review of RT interventions for dementia patients in community settings reported immediate improvements in communication, but the effects varied depending on the type of RT used [5]. While follow-up studies have shown that the effects can persist for several weeks or months, the impact remains modest [5]. Furthermore, a study on life review RT for residents with cognitive decline in nursing homes found that nurses who engaged in social activities with residents helped enhance relationships [35]. These findings suggest that to effectively address communication difficulties in elderly individuals with MCI, trained nurses should engage more closely with participants to facilitate better communication processes.

Regarding psychosocial variables, the RMTI program exhibited effectiveness only in terms of QoL. Elderly individuals with MCI who participated in the RMTI program demonstrated a significant improvement in QoL after the intervention compared to those who did not participate, and this improvement was maintained for an additional four weeks. To the best of our knowledge, no studies have directly examined this specific intervention; however, previous research supports these findings. For instance, an 8-session life review intervention significantly improved the quality of life immediately, as well as one and three months after the intervention for elderly individuals at a daycare center [36]. Similarly, a study involving four life review RT sessions found that older women living alone experienced significant improvements in quality of life compared to the control group [37]. Conversely, a study using a computer-based cognitive exercise program did not observe any effect on quality of life in older adults with MCI [6]. This suggests that the RMTI, grounded in the Life Review Theory [17],is effective in enhancing the quality of life for elderly individuals with MCI. The dual approach of individual and group sessions in the RMTI program, which aimed to boost both cognitive function and social interactions, may have contributed to the observed improvement in QoL [36]. However, despite positive outcomes in previous research, it is premature to attribute improvements in QoL solely to RT. Further studies are required to explore the effects of RMTI on the QoL in cognitively healthy older adults.

In terms of depression and anxiety, the RMTI program did not lead to any significant improvements in either measure among elderly individuals with MCI, as participants in both the intervention and control groups exhibited high baseline levels with no changes over time. This aligns with prior research, which found that programs stimulating cognitive functions and promoting social interactions did not significantly improve psychosocial outcomes, including depression and anxiety, after a three-month intervention period [6]. However, some studies have reported that digital RT interventions utilizing life storybooks can effectively improve emotional expression and reduce anxiety [3, 13]. These findings suggest that to enhance psychological functioning in elderly individuals with MCI, longer intervention durations—beyond six weeks or more than 12 sessions—may be required. Additionally, when therapists fail to assist individuals in integrating specific life experiences into their self-narrative, symptoms of depression may worsen [34]. Therefore, although the nurses in this study were trained before the intervention, skill development should be stressed among nurses who will be addressing depression during the program.

Limitations

This study has several limitations. Firstly, the sample size was small, and the population was drawn from a limited number of senior centers, which may affect the generalizability of the findings. Secondly, the control group was assessed only by postintervention, without follow-up measurements; future studies should incorporate follow-up measurements to better understand the long-term effects of the intervention. Thirdly, the study relied partially on self-reported measures, which may have introduced bias. Finally, the program was facilitated by trained nurses rather than therapists, as nurses typically conduct RT in Korea. Therefore, further research is needed to determine the broader applicability of the RMTI program's effects.

Conclusions

This study aimed to evaluate the effects of the RMTI program, a non-pharmacological digital RT intervention utilizing an online road map, to enhance cognitive function, promote social interaction, and improve psychosocial well-being. The findings demonstrated that the 12-session RMTI program significantly enhanced cognitive function and QoL in elderly individuals with MCI. These improvements in cognitive function, communication difficulties, and QoL were sustained up to four weeks post-intervention. Based on these positive outcomes, the findings from this pilot study suggest that the RMTI program could be effectively applied in community settings. The study provides valuable insights and practical approaches for advancing non-pharmacological therapies for older adults with MCI. Given the limited research on digital RT programs for older adults with MCI, further studies should investigate the potential of RMTI programs in preventing cognitive decline among cognitively healthy older adults.

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Author Contributions

Conceptualization, C. M. Cho; methodology, Y. H. Kim. and Cho CM. Software. Kim YH. and Cho CM., validation; Kim YH. and Cho CM., formal analysis; Kim YH. Cho CM.: investigation; Cho CM.: resources; Cho CM.: data curation; Kim YH. and Cho CM. Wrote the original draft, Kim YH., and Cho CM.: Writing —review and editing. Kim YH. and Cho CM., visualization; Kim YH. Cho CM., project administration; Cho CM., funding acquisition. All the authors have read and agreed to the published version of the manuscript.

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Informed Consent Statement

Informed consent was obtained from all participants involved in the study.

Data Availability Statement

Not applicable.

Conflicts of Interest

The authors declare no conflicts of interest.

Abbreviations

MCI: Mild Cognitive Impairment
RMTI: Road Map Time-Travel Intervention
RT: Reminiscence Therapy
ICT: Information and Communication Technology
QoL: Quality of Life

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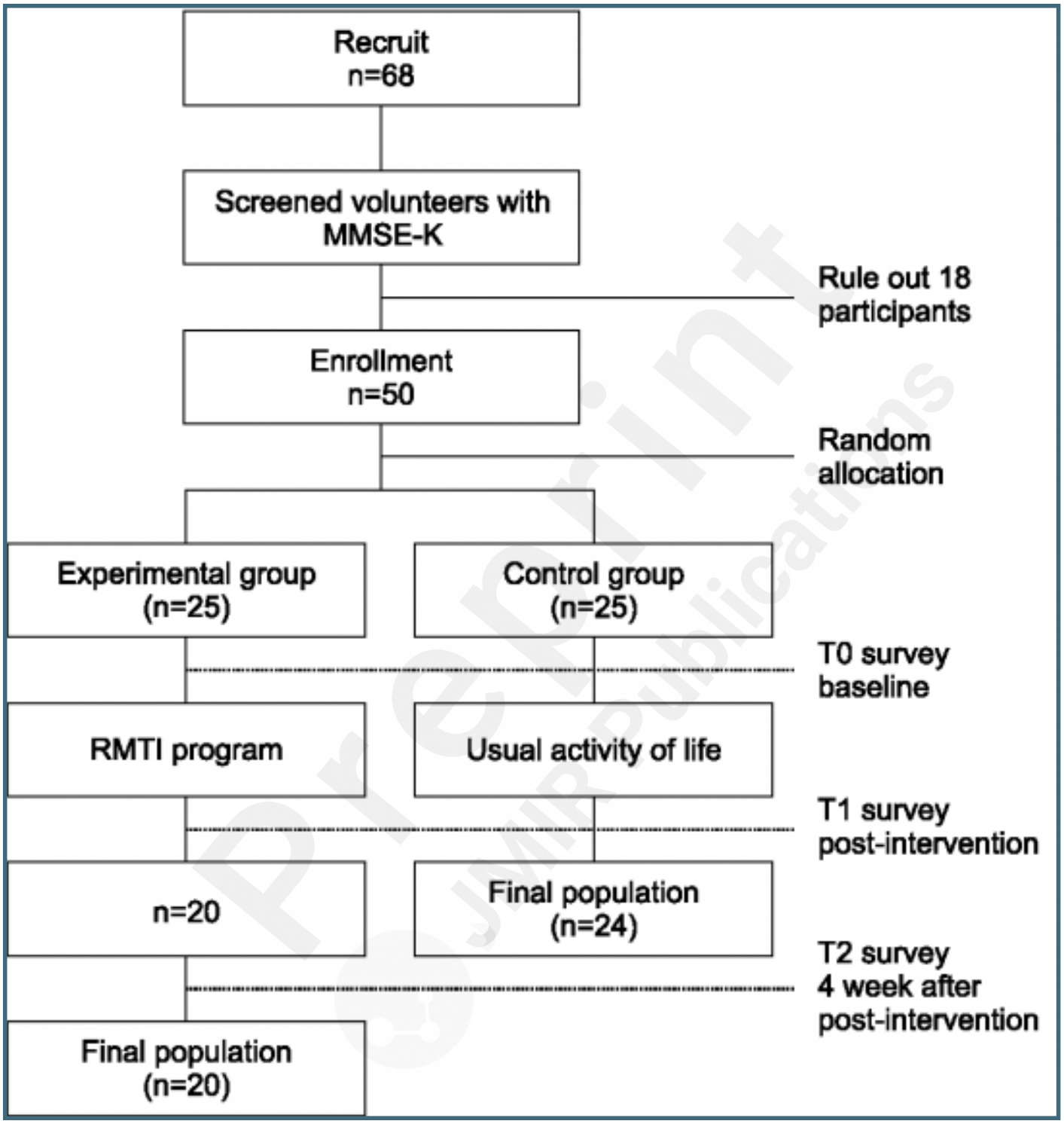
Figure Legends

Figure 1. Flow chart of participants.
Figure 2. Example of a road view utilizing an online map from the DAUM portal site.
Figure 3. Level of measurements between TO-T1-T2.

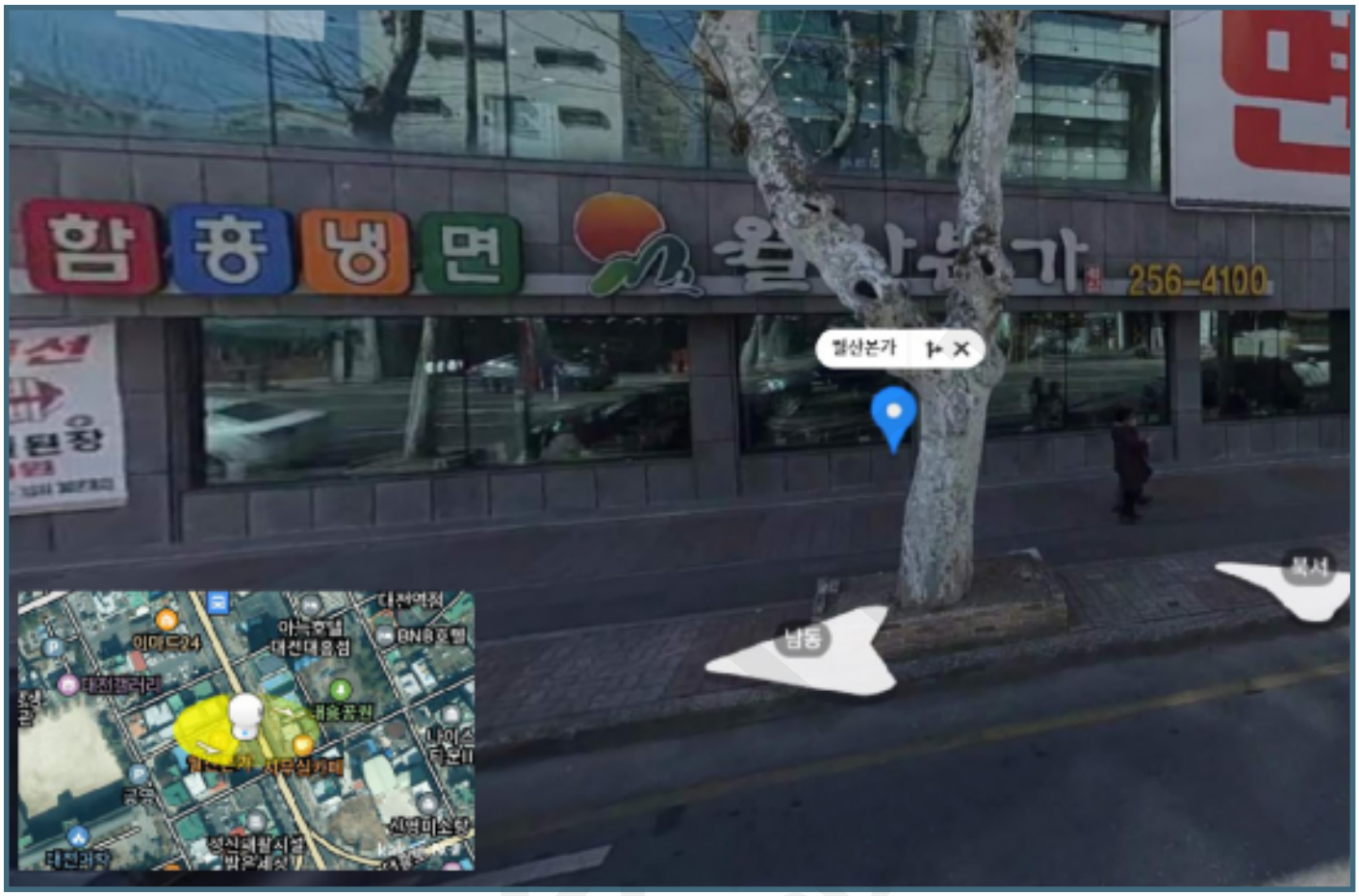
Supplementary Files

Figures

Flow chart of participants.



Example of a road view utilizing an online map from the DAUM portal site.



Level of measurements between TO-T1-T2.