The Effects of Dementia Partner Programs using Telephone on Cognitive and Neuropsychiatric Symptoms in Elderly Persons with Mild Cognitive Impairment: A Randomized Controlled Trial

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Abstract: Background/Objectives: To examine the effects of dementia partner programs on cognition, depression, and quality of life in elderly persons with mild cognitive impairment(MCI) residing in a community. Methods/Statistical analysis: In this study, 26 elderly persons with mild cognitive impairment were randomly assigned to an experimental group and a control group. The experimental group participated in a dementia partner program and a cognitive rehabilitation program, and the control group participated in the cognitive rehabilitation program for 10 weeks. MMSE-DS, and K-ACS were conducted with all subjects before and after the intervention in the same method. Findings: In the study results, a total of 23 subjects comprising 11 subjects in the experimental group and 12 in the control group were analyzed. The mean age was 79.91 ± 4.34 years. The experimental group showed significant improvement in the cognitive and self-esteem domains, while the control group showed a statistically significant improvement in the quality of life and self-esteem domains. Analysis of the variations by group indicated that the scores of all items showed positive effects in both groups while cognition and the quality of life showed statistically significant differences in the experimental group.

Improvements/Applications: The service should be systemized so that no persons are alienated by individually providing treatment and training programs using telephone to elderly persons residing in a community.

Keywords: Cognitive, Dementia, MCI, Neuropsychiatric symptom, Partner program, Telephone

I. INTRODUCTION

The proportion of elderly persons aged 65 years or more older in South Korea exceeded 7% in 2000 so that South Korean society became an 'aging society' and it reached 13.3% in 2016. In addition, it is expected that the proportion of elderly persons aged 65 years or more will become 15.7% with the number of those elderly persons exceeding one million and that South Korean society will become a 'super aged society' by 2030 when the number of those elderly persons will become 1.27 million[1]. The aging society due to the absolute increase in the elderly population involves many problems in relation to elderly persons' health[2]. f the elderly population, the elderly population is more vulnerable to the aging population.

Elderly persons become to stay home for longer time due to reduction in participation in production activities or leisure activities and this may bring about cognitive and emotional problems along with deterioration of physical abilities[3]. These problems lead to the deterioration of the quality of life of the elderly[4], and dementia, which can be said to be a representative geriatric disease, is also increasing[5].

Dementia deteriorates cognitive functions and causes behavioral and emotional changes, making social activities difficult. Mild cognitive impairment (MCI), which can be said to be a stage prior to dementia, refers to conditions where the patient has a normal range of cognitive functions and does not show any problem in leading daily life[6]. Given that the brain neurons are not easily regenerated once they have been damaged, it can be said that preventive treatment at the mild cognitive impairment stage, which is for groups with high risks of dementia, is more effective than commencing treatment after outbreak of dementia[7].

The prevalence of dementia in South Korea exceeds 9.8% and is recognized as a social problem[1]. As interest in the prevention of elderly persons' dementia has increased, since September 2008, the Ministry of Health and Welfare has implemented early dementia early screening projects centering on public health centers and based on the foregoing, diverse dementia prevention programs have been carried out for general elderly persons[8]. However, those programs have disadvantages in that not small amounts of costs are incurred in the process of organizing the programs and that elderly persons must firsthand visit the welfare center. Therefore, '1:1 counseling and education through telephone calls' is suggested as a new alternative to the elderly dementia prevention programs[9].

The dementia partner program using telephone can phone-based dementia partner program can compensate for the shortcomings of existing methods in that it helps early finding and prevention of dementia, requires low maintenance costs, enables 1: 1 care, and is not restricted by time or place[10]. In addition, its effectiveness was proved as it has been identified to be an intervention that enables patients with chronic diseases such as diabetes or Parkinson's disease to lead independent daily living and rationally control the disease [11, 12], and improves depressive states[13,14]. In cases where telephone counseling was provided to family caregivers, the relevant program was proved to be an effective intervention method as the subjects of intervention showed improvement in physical health conditions,

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decreases in depression, along with improvement in their sense of personal fulfillment[15,16].

Despite that the telephone counseling program has been proved to be an effective intervention method for patients with chronic diseases or their caregivers, no study proved the effectiveness of the intervention for prevention of dementia, which is an important disease in modern society. The purpose of this study is to investigate the effect of the dementia partner program through telephone on cognition, depression, and quality of life in elderly persons with mild cognitive impairment residing in the community by implementing the program.

II. MATERIALS AND METHODS

2.1. Study subjects

This study was conducted with 26 elderly persons showing mild cognitive impairment symptoms among those who were in Jecheon ○ ○ Welfare Center in Jecheon, Chungbuk. Written agreements were received from the subjects after explaining the purpose and intent of the study and the subjects were informed that they could stop participation during the period of the program. Study numbers were given to the 26 subjects and the subjects were randomly assigned to an experimental group and a control group.

The subject selection criteria are as follows.

1) Those who could communicate for 5~10 minutes using telephone

2) Those who could continuously participate in the group program for about 90 minutes per session and are not accompanied by other physical or mental disorder

3) Those who had not participated in any similar program and voluntarily agreed to participate in the program

2.2.Study Design

2.2.1. Study procedure

In this study, the programs were provided to the subjects divided into the experimental group and the control group from September to December 2017. The experimental group was applied with the cognitive rehabilitation program along with the dementia partner program using telephone and the control group was applied with only the cognitive rehabilitation program. All subjects underwent pre-evaluation (MMSE-DS, S-GDS, GQOL-D, self-esteem) before intervention and post-evaluation 11 weeks later in the same method. Of the 26 subjects in total, data from 23 subjects were analyzed as results excluding one control group who were absent three or more times and two in the experimental group who quitted during the period due to personal reasons.

2.2.2. 1:1 dementia partner program using telephone

The protocol of the telephone 1: 1 dementia partner program using telephone was developed by the researchers together with a professor of the Department of Occupational Therapy based on programs used in previous studies[17-19]. after modifying and supplementing the programs. These researchers completed the training course as college student partners for the prevention of dementia and improvement of recognition of dementia in the dementia partner program implemented at the Central Dementia Center.

The goal of the program was to improve the cognition, depression and quality of life of elderly persons with mild cognitive impairment and the content consisted of daily schedule, cognition, and counseling items. The daily life items included talking about news contents, telling daily routine, establishing next day or weekly plans. The cognition items were composed by day of the week as calculation checking for Monday, counting numbers reversely for Tuesday, related word listing game for Wednesday, and pair word telling for Thursday and were phased by week. The counseling items consisted of physical self-monitoring, stress intervention, health promotion, mental self-monitoring, nutrition and diet, social competence, difficulties in the community, and physical and mental change self-monitoring [Table 1].

The program was composed of 40 sessions implemented for 10 weeks with four sessions per week and the talk time was 5 to 10 minutes per session. The call time was determined individually according to the schedules of individuals through individual counseling during the prior evaluation and phone calls were always made by the researchers.

Table 1. Partner program protocol using telephone

	Daily Schedule	Cognition	Counseling
1week	· talking about news contents · establishing next day or weekly plans	1 level	physical self-monitoring
2week			stress intervention
3week		2 level	health promotion
4week			mental self-monitoring
5week		3 level	nutrition and diet
6week			social competence
7week		4 level	difficulties in the community
8week			physical and mental change self-monitoring

2.2.3.Cognitive rehabilitation program

The contents of the cognitive rehabilitation program consist of dementia prevention gymnastics, cognitive stimulation program, cognitive activity program, and finishing gymnastics. The dementia prevention gymnastics were developed by the Ministry of Health and Welfare and the Central Dementia Center, and increase blood circulation and cognitive function of the brain through the effects of aerobic exercise. The cognitive stimulation program can stimulate the brain through activities using shapes and colors. Examples include matching shape cards, finding the same pictures, and finding the route in a maze.

The cognitive activity program allows activities of firsthand physical movements through stimulated cognition after activating the cognition. Examples of the activities include bowling, making lucky bags, and building blocks. This program was implemented in the experimental group and the control group for 90 minutes per session, one session per week for 10 weeks.

2.3.Study tool

2.3.1. Korean version of Mini-Mental State Examination for Dementia Screening (MMSE-DS)

This tool implemented in this study was made as a Korean version of Mini-Mental State Examination for Dementia Screening (MSE-DS) in a study conducted by Kim et al.[20] based on the Mini Mental State Examination (MMSE) developed by Folestein et al.[21] by improving the limitations in the existing MMSE and reflecting the literary characteristics and demographic characteristics of South Korean elderly persons(Han et al., 2014). The number of test items is 19 in total, which measure orientation for place and time (10 points), judgment in relation to daily life (2 points), language function(6 points), immediate recall (3 points), concentration (5 points), delayed recall(3 points), and constructive ability (1 point) and the full score is 30 points. The higher the scores, the better the cognitive functions. The internal consistency was (Cronbach's) α = .83[22].

2.3.2. Short Form Geriatric Depression Scale; S-GDS

This tool used in this study was the Short Form Geriatric Depression Scale made by translating the self-reporting Geriatric Depression Scale with 30 items developed by Yesavage et al.[23] and standardizing the translated tool[24]. This tool uses type 2 variables for 15 items for yes (1 point) or no (0 point) answers. The total score ranges from 0 to 15 points. The higher the score, the more severe the degree of depression. The scores range from normal (0-4), mild depression (5-9), and severe depression (10-15)[24]. The internal consistency was (Cronbach's) α = .92[25].

2.3.3. Geriatric Quality of Life -Dementia (GQOL-D)

This tool used in this study was the Geriatric Quality of Life -Dementia; GQOL-D) made by condensing the Geriatric Quality of Life (GQOL) consisting of 25 items developed by Lee Hyong-seok et al.[26] based on the WHO Quality of Life Scale to have 15 items. Of the 15 items in total, 13 items consist of items regarding physical health, psychological health, environment, social relations, one item measures overall health, and one item measures satisfaction with life[26]. The scores of GQOL-D is indicated with a 4-point scale, the total score is calculated by summing up the responses to each item, and ranges from 15 to 60 points. The higher the score, the higher the satisfaction with the quality of life in the patient's subjective experience. The internal consistency (Cronbach's) was α = .87[27].

2.3.4. Self-Esteem

This tool was a self-esteem measurement tool developed by Rosenberg and a version translated by Kim Mun-joo was used in this study. It consists of 11 items with a 5-point scale. The total score ranges from 11 to 55 points. The higher the score, the higher the self-esteem. The internal consistency (Cronbach's α) at the time of development was .85[28].

2.4.Statistical analysis

The general characteristics of the subjects in the experimental group and the control group and the distribution of the initial evaluation values were identified by the frequencies and percentages of descriptive statistics. Shapiro-Wilk tests were conducted to examine the normal distributions of the two groups and non-parametric statistical analyses were conducted based on the results. Wilcoxon signed ranks tests were conducted to verify whether the differences between before and after intervention in the experimental group and the control group were significant. Mann-Whitney U- tests were conducted to compare and verify differences in variations between the experimental group and the control group. All the data collected in this study were processed using SPSS 18.0 and the significance probability of all statistics was set to $p < .05$.

III. RESULTS AND DISCUSSION

3.1. General characteristics of the subjects

The experimental group consisted of five males and six females and the control group consisted of six males and six females. Therefore, the total number of subjects was 23. The mean age of the experimental group was 79.83 years and that of the control group was 81.85 years. The residence type of all the subjects was married couple, the physical health status was medium, and education levels were shown to be elementary school graduation by the largest number of subjects [Table 2].

Table 2. Characteristics of participants

		Experimental group (n=11)	Control group (n=12)	Total (n=23)
sex	male	5	6	11
	female	6	6	12
ages	M±SD	79.83±4.13	81.85±4.72	79.91±4.34
cohabitation	alone	5	5	10
	couple	6	5	11
	children	0	2	2
physical health	very healthy	1	1	2
	healthy	0	0	0
	middle	6	8	14
	not good	3	3	6
	very not good	1	0	1
education level	none	2	3	5
	primary	6	7	13
	middle	1	1	2
	high	1	0	1
	above university	1	1	2

3.2. Changes in the cognition, depression, quality of life, and self-esteem of between prior and posts evaluation in the experimental group and the control group

After participating in the dementia partner telephone intervention program and the cognitive rehabilitation program, the experimental

group showed significant improvement in the domains of cognition and self-esteem as the total score of MMSE-DS increased from 25.91 ± 2.25 to 27.36 ± 1.91, and the total score self-esteem increased from 25.91 ± 2.25 to 37.36 ± 5.10($p < .05$). There was no statistically significant difference in S-GDS and GQOL-D, but the scores were changed positively after the intervention.

The control group showed statistically significant improvement as the total score of GQOL-D increased from 36.57 ± 10.84 to 46.43 ± 5.62, and the total score of self-esteem increased from 21.14 ± 6.38 to 40.57 ± 5.38 after the intervention with the cognitive rehabilitation program ($p < .05$). There was no statistically significant difference between in MMSE-DS and S-GDS, but the scores changed positively after the intervention [Table 3].

Table 3. Comparison of pre and post test of experimental group and control group

	Experimental group			Control group		
	Pre-test (n=13)	Post-test (n=11)	*p*	Pre-test (n=13)	Post-test (n=12)	*p*
MMSE-DS	25.91±2.25	27.36±1.91	.034*	21.14±6.38	23.14±4.37	.072
S-GDS	5.82±4.21	4.18±2.82	.065	3.57±3.04	1.57±1.39	.093
GQOL-D	35.04±3.38	39.88±6.21	.053	36.12±3.84	46.43±5.62	.027*
Self-esteem	25.91±2.25	37.36±5.10	.004*	21.14±6.38	40.57±5.38	.018*

*p<.05, MMSE-DS: Mini-Mental State Examination for Dementia Screening, S-GDS: Short Form of Geriatric Depression Scale, GQOL-D: Geriatric Quality of Life-Dementia

3.3. Comparison of cognition, depression, quality of life, and self-esteem in pre- and post-assessments by group

When the cognition, depression, quality of life, and self-esteem in the experimental group, that would be applied with the dementia partner telephone intervention program and the control group not to be applied with the foregoing program were compared with each other in the prior assessment, there was no statistically significant difference ($p < .05$) Therefore, the two groups can be interpreted as having statistically the same cognition, depression, quality of life, and self-esteem states.

However, although post-test scores showed positive effects on all items, statistically significant differences appeared in MMSE-DS and GQOL-D ($p < .05$). This result can be interpreted as indicating that the dementia partner program using telephone had positive effects on the cognitive function and the quality of life In addition, differences in the method of intervention and differences in the frequency of intervention may have affected the results [Table 4].

Table 4. Comparison of Pre and Post test by Group

	Pre-test			Post-test		
	Experimental group (n=13)	Control group (n=13)	*p*	Experimental group (n=11)	Control group (n=12)	*p*
MMSE-DS	25.91±2.25	21.14±6.38	.292	27.36±1.91	23.14±4.37	.032*
S-GDS	5.82±4.21	3.57±3.04	.059	4.18±2.82	1.57±1.39	.094
GQOL-D	34.64±6.31	36.57±10.84	.318	39.18±8.29	46.43±5.62	.037*
Self-esteem	25.91±2.25	21.14±6.38	.059	37.36±5.10	40.57±5.38	.092

*p<.05, MMSE-DS: Mini-Mental State Examination for Dementia Screening, S-GDS: Short Form of Geriatric Depression Scale, GQOL-D: Geriatric Quality of Life-Dementia

We could not find any paper that applied a dementia partner program using telephone to patients with mild cognitive impairment or dementia to analyze the effects of the program on cognition and self-esteem. In studies where cognitive rehabilitation and counseling using telephone were provided caregivers of dementia patients, depression, assistance support, physical health symptoms were significantly improved[10,29]. The results of application of a training and counseling program using telephone to patients with diabetes showed statistically significant effects on the quality of life and depression, inconsistently with the results of this study [30]. However, the foregoing is considered attributable to differences in subjects and intervention period from this study.

The results from the control group in a study were consistent with the results of this study as the group of elderly persons with mild cognitive impairment provided with cognitive stimulation training and cognitive training showed statistically significant improvement in memory and the quality of life[31]. In addition, in a study where a cognitive enhancement program consisting of 12-sessions was provided,

25 subjects in the experimental group out of 42 elderly persons with mild cognitive impairment showed significant improvement in all of the items of MMSE-K. S-GDS, and Self Esteem[2]. The foregoing results were consistent with the results of this study for depression and self-efficacy but were inconsistent with the results of this study for MMSE. This is considered attributable to differences in statistical analysis due to differences study tools and analysis methods.

As for limitations of this study, the number of subjects was small so that the results could not be easily generalized. Although statistical processing was conducted with nonparametric measures to complement this point, in future studies, many subjects should be recruited. In addition, although the dementia partner program using telephone was developed with trained researchers specialized professors, the validity and reliability of the program were not objectively presented. In addition, since there was no previous study with the same design as this study, it was difficult to compare and interpret the results. Therefore, the telephone counseling program for dementia patients should be actively studied hereafter.

IV. CONCLUSION

This study provided a cognitive rehabilitation program and a dementia partner program using telephone, which are actively implemented now, as interventions for mild cognitive impairment patients. The results of this study indicated that cognition, depression, quality of life, and self - efficacy were improved after the program. In particular, it could be seen that cognitive function and the quality of life were improved further in the experimental group provided with the dementia partner program. Therefore, the service should be systemized so that no subjects are alienated by individually providing treatment and training programs using telephone to those subjects who cannot be provided with cognitive rehabilitation programs for groups. We hope that the results of this study will be used as basic data for researchers studying dementia.

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