Changes in Depression and Stress of the Middle-Aged and Elderly through Participation in a Forest Therapy Program for Dementia Prevention

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ABSTRACT

Various health and social issues related to the elderly are emerging in line with the rapid aging of the population. In particular, dementia currently has a prevalence of about 10 percent of the elderly population in South Korea, which increases financial and social burdens to not only individual patients but also their caring family. To assess the effects of participating in the forest therapy programs for dementia prevention, this study recruited participants aged 50 and above and tested their depression (Korean form of Geriatric Depression Scale; KGDS) and stress response (Modified form of Stress Response Inventory; SRI-MF), which are emotional aspects of dementia. As a result, KGDS showed a significant decrease of 3.2 points from 8.4 to 5.2 points, and SRI-MF showed a significant decrease of 7.2 points from 40 to 32.8 points, indicating a statistically significant improvement in both. In addition, participants with minor depression and high level of stress in the pretest showed statistically significant improvements in the SRI-MF for men, and the KGDS and SRI-MF for women. Furthermore, there were statistically significant improvements in KGDS for participants in their 60s and in SRI-MF for those in their 70s in terms of age, and in both KGDS and SRI-MF for participants with chronic diseases and in KGDS for participants without chronic diseases. This study confirmed the effects of forest therapy on the prevention of the emotional aspects of dementia and laid the groundwork for increasing the applicability of forest therapy by obtaining a place for dementia prevention as a field of forest therapy.

Keywords: elderly welfare, forest therapy, KGDS, SRI-MF

Introduction

The aging society is defined as the country or region in which the share of population aged over 65 exceeds 7% of the entire population, according to the UN standards. The aged society is when it exceeds 14%, and the super-aged society is when it exceeds 20% (National Archives of Korea, 2007). The Korean society has entered the aging society with the share of population aged over 65 at 7.2% in 2000, and the aging speed is accelerated by the tendency to avoid birth and advancement of medical science. According to Statistics Korea (2019), the share of population aged over

65 was 7.2% in 2000, but it has nearly doubled to 13.8% in 2017, and is expected to rise to 15.7% in 2020 and 25% in 2030, thereby entering the super-aged society. Moreover, the elderly population is expected to be 43.9% in 2060. The increase of the elderly population is raising various social, economic and health-related issues. Dementia, one of the typical geriatric illnesses, has the prevalence of 10.16% among the population aged over 65 as of 2018, which is about one tenth of the entire elderly population. According to Article 2 of the Dementia Management Act, “dementia means an acquired composite disorder that affects a person's daily life as a result of a degenerative brain

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disorder or cerebrovascular disease that deteriorates a person's faculties of memory, language, orientation, judgment, and performance". As such, dementia is an illness that not only deteriorates the quality of life for the patients with its symptoms but also causes great burden and difficulties for the family about care, and thus it should not be left as a personal matter. Accordingly, the government is aware of the social and economic loss caused by dementia and has been implementing the National Dementia Initiative since 2017 with emphasis on national responsibility. The National Dementia Initiative is based on the following points: 1) establishing an infrastructure for dementia management, 2) alleviating the financial burden of the patient's family, and 3) expanding the scope of management such as patients with a mild case.

Dementia is incurable at this time and its symptoms are only delayable (Yang et al., 2019), which is why it is important to prevent dementia in the first place. Moreover, according to the report by the National Institute of Dementia in the Ministry of Health & Welfare (National Institute of Dementia, 2018a), the total cost of dementia management in Korea has exceeded KRW 15 trillion and is doubling every decade. By 2060 when the elderly population aged over 65 will be 43.9%, the cost of dementia management is expected to reach KRW 106 trillion, which raises the need for prevention of the disease as much as management (National Institute of Dementia, 2018b).

Dementia is emotionally accompanied by anxiety and depression (Park, 2016). In particular, depression occurs frequently among the elderly due to weakening of physical functions, loss, retirement and decline of cognitive skills like dementia, which is why it can be an important emotional variable as a psychological health index for the elderly, and thus it is important to relieve depression to improve the elderly's mental health and quality of life (Kim and Kim, 2011). Depression is the most common problem in senescence in relation to the psychological adjustment of the elderly, and physical health and cognitive functions are affected by the severity of depression and cause all kinds of malfunction (Lee et al., 2009). Moreover, stress is a physiological and psychosocial state caused by the imbalance in the interaction between individuals and the environment, and it affects the level of depression (Kim and

Kang, 2018; Yun, 2014). Above all, depression in adolescence and late middle age is analyzed as a risk factor for the onset of dementia in senescence. It is also reported that the experience of suffering depression 10 years before the onset of dementia is a risk factor for Alzheimer's disease, and 27% of patients suffering from both Alzheimer's disease and depressive disorder had depression in the past (as cited in Kim, 2004). Moreover, depressive symptoms of the elderly are treatable causes of dementia (Gi, 1999), and neglecting depression without treating it at the right time causes pseudodementia (depression accompanied by damage in cognitive functions). As a result of monitoring long-term progress of depressive patients with pseudodementia, it was found that they were more likely to lead to actual dementia than others (Bae, 2002). These studies and reports prove that depression can be a risk factor of the onset of dementia. Thus, this study carried out a forest therapy program for dementia prevention and measured depression and stress.

The forest therapy program for dementia prevention is designed by using forest healing factors such as plants and forests that have positive effects on depression and stress. This is based on studies discovering that forests have a positive impact on the perception about stressful daily life and health (van den Berg et al., 2010), that horticultural activities using plants reduce depressive symptoms of the elderly with dementia (Kim et al., 2010), that cognitive levels of stress and depression among groups carrying out green activities and residents living in a space where gardening is possible were lower than other activities and regions (Kang et al., 2015), that participating in horticultural therapy programs had a positive impact on decreasing the depression of the elderly with dementia (Lee et al., 2007), and that the natural environment is an effective measure to deal with urban stress and that a forest therapy program carried out with middle-aged women had positive effects on stress, proved by the semantic differential scale, mood state, pulse rate and cortisol (Ochiai et al., 2015). By proving the positive emotional effect (depression and stress) of the forest therapy program on dementia prevention, we intend to lay the groundwork for programs using green resources such as forests to perform a positive role in lowering the social costs related to dementia.

Research Methods

Subjects

The subjects are 60 participants aged 50 and above who participated in the elderly forest therapy program for dementia prevention twice from August to September 2018 at the National Center for Forest Therapy and Hoengseong SoopCheWon (National Center for Forest Activities, Hoengseong). Forty of them participated in the National Center for Forest Therapy program in association with the local elderly counseling center, and 20 participated in the Hoengseong SoopCheWon program in association with the elderly nursing home.

Forest therapy program for dementia prevention and sites

Forest therapy program for dementia prevention

The forest therapy program for dementia prevention was developed using forest healing factors to prevent dementia and was a two-day overnight program. The program at National Center for Forest Therapy was carried out on August 15-16, 2018. The program consisted of ‘Awakening the senses’ and ‘Healing in the wave’ activities for Day 1, and ‘Healing for healthy life until age 100’ activity for Day 2. The program at Hoengseong SoopCheWon was carried out on September 6-7, 2018. The program at Hoengseong consisted of ‘Forest of physical experience’ and ‘Forest of

mental experience’ activities for Day 1, and ‘Forest of finding myself’ activity for Day 2. The programs were designed differently depending on the environmental and facility characteristics of each site, but they share the common factor that they are both based on use of the forest environment and forest healing factors (Table 1, Fig. 1).

Research site

The forest therapy program for dementia prevention was carried out in the National Center for Forest Therapy and Hoengseong SoopCheWon. The National Center for Forest Therapy extends 683ha from Yeongju and Yecheon in Gyeongbuk and has health checking and healing equipment, health promotion center, training center, water healing center, forest healing cultural center and accommodations. The main tree species are oak, nut pine, pine and larch, and there are also nine main forest paths 455 km long including a barrier-free deck road for persons with disabilities, the elderly and the infirm, along with a garden adjacent to a valley and a garden where visitors can walk barefoot. Hoengseong SoopCheWon is located in Hoengseong in Gangwon-do with an area of 712ha where it has a visitor center, forest cultural experience building, auditorium, lecture hall, heat/water healing facilities and accommodations. The main tree species are oak, larch and nut pine, as well as Norway spruce in the forest. Moreover, there are six main forest paths 22 km long including a barrier-free deck

Table 1. Contents of forest therapy program for dementia prevention

Place	Activity	Purpose	Contents
National Center for Forest Therapy	Awakening the senses	Focus on tactile sensation, sensory stimulation, and improving memory	Making name tags with natural objects, physical stimulation, memory games to enhance awareness, and clapping for health
	Healing in the wave	Improving muscle endurance, relaxing and stabilizing mind and body through low-intensity swimming exercise	Aqua exercise, pair exercise, workout with the aqua noodles, underwater dance, and use of healing facilities in pool
	Healing for healthy life until age 100	Promoting metabolism and relieving life stress	Experiencing healing equipment (water baths Acualine, aqua-massage spa, half bath, etc.)
National Center for Forest Activities, Hoengseong	Forest of Physical Experience	Improving concentration and enhancing sense of achievement	Cognitive improvement gymnastics, a word association game, photography exhibitions of memories
	Forest of Mental Experience	Relaxing mind and body through five senses stimulation	Forest trail walk, Aroma oil massage, forest meditation, herbal tea time
	Forest of Finding Myself	Restoring confidence and reminiscence	Expressing and portraying yourself on sand animation board

Fig. 1. Pictures from forest therapy program for dementia prevention. Participants are performing in activities of Awakening the senses (A), Healing in the wave (B), and Forest of physical experience (C).

Fig. 2. View of National Center for Forest Activities, Hoengseong (A) and National Center for Forest Therapy (B).

road, along with the five senses experience center and ecological experience center (Fig. 2).

Measurement and analysis

Measurement method

Depression and stress measurement of the forest therapy program for dementia prevention was conducted through a self-administered survey before and after the program. The pretest measurement was performed by sending the questionnaire to the institution to which the participants belong after participation was confirmed and collecting data from the participants, who filled out the questionnaire on their own if they could and were helped out by the management staff if not. The posttest measurement was performed by collecting data after the program from those who completed the pretest survey, having them fill out the questionnaire on their own if they could or get help from the management staff if not in a lecture hall. The names

and dates of birth were included in the pretest and posttest surveys to verify the effects before and after participation. This study provided a dementia prevention program based on forest therapy in terms of forest welfare and measured its effectiveness without any intervention other than the self-administered survey for measurement.

Measurement tools

The Korean Form of Geriatric Depression Scale (KGDS) and Modified form of Stress Response Inventory (SRI-MF) are used to measure the effect of the forest therapy program for dementia prevention on relieving depression and stress. The KGDS is based on the Geriatric Depression Scale (GDS) developed by Yesavage (1983, as cited in Kim and Kim, 2011) to measure the level of elderly depression, which is revised and supplemented by Jeong et al. (1997, as cited in Kim and Kim, 2011) to be more suitable for the elderly in Korea (Kim and Kim, 2011). The questionnaire comprises 30 items: seven items in emotional dis-

comfort, six items in negative thinking and unhappiness, eight items in physical weakening and increased health concerns, six items in cognitive dysfunction, and three items in social withdrawal and decreased activities. The responses for positive items were ‘Yes (0 point)’ or ‘No (1 point)’ and negative items were ‘Yes (1 point)’ or ‘No (0 point)’, with higher scores indicating higher level of depression. The base score is 14 out of 30 points, with scores between 14 and 18 representing depression suspected and mild depression, 19 and 21 representing moderate depression, and 22 or higher representing severe depression. Cronbach’ α of the KGDS in this study is .879. The SRI-MF is based on the Stress Response Inventory (SRI) developed by Ko et al. (2000, as cited in Choi et al., 2006) for the emotional state of Korea to evaluate stress response, which is reviewed and revised by Choi et al. (2006) with more diverse and extensive samples to increase usability in clinical practice. The questionnaire comprises 22 items: nine items in somatization, eight items in depression, and five items in anger. The responses are rated on a 5-point Likert scale from ‘Strongly disagree (1 point)’ to ‘Strongly agree (5 points)’. The full score for all items is 110 points, with higher scores indicating higher level of stress response (Choi et al., 2006). Cronbach’ α of the SRI-MF in this study is .961.

The KGDS is used in studies determining the depression relief effect of Gestalt group therapy on remarried elderly women (Kim and Kim, 2011), proving the depression level of the elderly with mild cognitive impairment (Kim and Song, 2019), measuring the depression level to determine the key factors that affect elderly depression (Huh and Yoo, 2002), and verifying the utility of elderly depression tests for elderly patients with cognitive impairment and their guardians (Sohn et al., 2011). The SRI-MF is used in studies verifying the relationship between elderly stress and obesity (Kim, 2018), proving the effect of body scan meditation on stress of female adults (Park, 2014), proving the effect of well-being cognition meditation on stress of office workers (Kang, 2019), and verifying the effect of running a stress management program for job seekers at job centers nationwide (Lim et al., 2011).

Analysis method

Data processing and analysis of results from the surveys conducted were carried out using the SPSS v.20 program. Frequency analysis was conducted for general characteristics of the participants, and paired samples t-test and non-parametric test were conducted based on test of normality for the effect of participation before and after the program and the participation effect according to each characteristic of the participants. The level of statistical significance of data was set as $p < .05$ for analysis.

Results and Discussion

General characteristics

There were twice more female participants (66.7%) than male (33.3%), and they were mostly in their 60s (35%) and 70s (33.3%). Most of them were college graduates or higher (43.3%), and most either lived alone (35%) or with their spouse (43.3%). Moreover, the participants mostly felt that their economic status was average (56.7%), and many of them were Catholics (33.3%) or Buddhists (31.7%; Table 2).

Moreover, more than 70% of the participants felt their physical condition was fair (36.7%) or good (35%). 56.7% had chronic diseases, mainly metabolic syndromes like hypertension (30.8%) and diabetes (23%), and most of them felt they had enough daily living activity skills to do everything on their own (66.6%; Table 3).

Results of participating in the forest therapy program for dementia prevention

Effects of participating in the forest therapy program for dementia prevention

We carried out the two-day overnight forest therapy program at the National Center for Forest Therapy and Hoengseong SoopCheWon with those aged 50 and above who participated in the forest therapy program for dementia prevention and examined their depression and stress levels. As a result of the test of normality, the p value of S-W (Shapiro-Wilks) test was less than .05, rejecting the null hypothesis, and thus data was tested using a nonparametric

Table 2. Demographics characteristics of the participants

	Classification	Frequency	Percent(%)
Gender	Male	20	33.3
	Female	40	66.7
Age	50s	7	11.7
	60s	21	35.0
	70s	20	33.3
	Over 80s	11	18.3
	Unknown	1	1.7
Educational background	Uneducated	8	13.3
	Elementary school	8	13.3
	Middle school	2	3.3
	High school	15	25.0
	Undergraduate or higher	26	43.3
	Unknown	1	1.7
Lives with	Alone	21	35.0
	Spouse	26	43.3
	Children	3	5.0
	Spouse and children	6	10.0
	Spouse, children, and grandchildren	1	1.7
	Others	3	5.0
Economic status	Very wealthy	2	3.3
	Affluent	9	15.0
	Fair	34	56.7
	Poor	8	13.3
	Very poor	7	11.7
Religion	Buddhism	19	31.7
	Catholic	20	33.3
	Christianity	9	15.0
	Confucianism	2	3.3
	Taoism	9	15.0
	Others	1	1.7
Total		60	100

Table 3. Physical health conditions of participants

	Classification	Frequency	Percent(%)
Physical condition	Very good	5	8.3
	Good	21	35.0
	Fair	22	36.7
	Bad	9	15.0
	Very bad	3	5.0
Chronic diseases present	Yes	34	56.7
	No	25	41.7
	No answer	1	1.7
Diagnosis of diseases	Hypertension	12	30.8
	Stroke/cerebrovascular diseases	0	0
	Angina/myocardial infarction	4	10.3
	Diabetes	9	23
	Anemia	1	2.6
	Thyroid disease	2	5.1
	Lung diseases/chronic bronchitis	0	0
	Sinus infection/sinus surgery	1	2.6
	Asthma	0	0
	Cancer	0	0
	Chronic headache/migraine	0	0
	Allergic rhinitis/dermatitis	0	0
	Others	8	20.5
	Both hypertension and diabetes	2	5.1
Daily living activity	I can do all the activities on my own.	40	66.6
	I can do all the activities by myself, but I feel uncomfortable.	12	20.0
	I need some help for activities.	4	6.7
	It is difficult to live without the help from others.	0	0
	I can't do anything by myself.	0	0
	No answer	4	6.7
Total		60	100

test. The result showed that the KGDS showed a statistically significant improvement by 3.1 points from 8.27 to 5.17, and SRI-MF showed a significant decrease by 7.24 points from 39.97 to 32.73. This indicates that the forest therapy program is effective in relieving elderly depression and stress (Table 4). This is also consistent with the results of previous studies that forest healing factors such as plants and factors have positive effects on depression and stress, which proved that horticultural therapy relieves depression

of the elderly with visual impairment (Kim et al., 2014), group horticultural therapy relieves depression of the elderly (Han et al., 2009), green spaces and program activities that involve contact with plants lower elderly stress (Kang et al., 2015), participating in a forest therapy program decreases the level of depression (Shin and Oh, 1996), the therapeutic functions of forests relieve depression (Shin et al., 2007), and therapeutic functions of forests relieve elderly depression (Lim et al., 2014).

Table 4. Changes in depression and stress before and after participation in forest therapy program for dementia prevention

Category		N	M	SD	Z	p
KGDS	before	60	8.27	6.02	-3.725	.000*
	after		5.17	5.16		
SRI-MF	before	60	39.97	17.86	-3.549	.000*
	after		32.73	12.64		

Note. KGDS= Korean form of Geriatric Depression Scale; SRI-MF= Modified form of Stress Response Inventory.

* $p < .05$ by Wilcoxon signed-rank test.

Table 5. Changes in depression and stress before and after participation in forest therapy program for dementia prevention by location of therapy

Category			n	M	S	Z	p
National Center for Forest Therapy	KGDS	before	40	4.64	2.76	-2.793	.005*
		after		3.00	2.67		
	SRI-MF	before	40	30.90	7.45	-3.489	.000*
		after		27.10	5.12		
National Center for Forest Activities, Hoengseong	KGDS	before	20	15.35	3.95	3.340 ^y	.003 ^{y*}
		after		9.3	6.22		
	SRI-MF	before	20	57.70	18.96	-2.148	.032*
		after		44.00	15.55		

Note. KGDS= Korean form of Geriatric Depression Scale; SRI-MF= Modified form of Stress Response Inventory.

^yt-test was performed for the statistics, ^{y*} $p < .05$ by t-test.

* $p < .05$ by Wilcoxon signed-rank test.

Effects of participating in the forest therapy program for dementia prevention by region

We analyzed the effects of each research site to verify whether there is a difference in effects depending on the participants of the National Center for Forest Therapy and Hoengseong SoopCheWon where the forest therapy program for dementia prevention was implemented. As a result of the test of normality for the National Center for Forest Therapy, the p value of S-W test was less than .05 and thus data was tested using the nonparametric test. The participants of the National Center for Forest Therapy program showed a significant decrease of 1.61 points in KGDS from 4.58 to 2.97, and a significant decrease of 3.84 points in SRI-MF from 30.87 to 27.03 (Table 5). As a result of the test of normality for Hoengseong SoopCheWon, the p value of S-W test was more than .05 for KGDS, accepting the null hypothesis that there is normality and thus the t-test was conducted, whereas the p value of S-W test was less than .05 for SRI-MF and thus the nonparametric test was

used. The participants of the Hoengseong SoopCheWon program showed a significant decrease of 6.05 points in KGDS from 15.35 to 9.3, and a decrease of 13.7 points in SRI-MF from 57.70 to 44 (Table 5). Forty participants of the National Center for Forest Therapy were in association with the local elderly counseling center, and the pretest scores of KGDS and SRI-MF were both within the normal range. Twenty participants of Hoengseong SoopCheWon were in association with the elderly nursing home, and the pretest score of KGDS was 15.35 points, showing mild depression, and that of SRI-MF was 57.7 points, showing a high level of stress response. Moreover, the participants of Hoengseong SoopCheWon, which showed mild depression and high stress response in the pretest scores, showed a greater decrease in scores. The result showed that the forest therapy program for dementia prevention was effective in not only participants with high depression and stress levels but also those with normal levels.

Effects of the forest therapy program for dementia prevention according to the general characteristics of participants

We analyzed the difference in effects according to the general characteristics of participants to determine whether the effects vary depending on the general characteristics. To begin with, we analyzed the difference in effects by gender. As a result of the test of normality, the p value of S-W test was less than .05, rejecting the null hypothesis, and thus data was tested using a nonparametric test. Male participants showed a decrease in KGDS and SRI-MF after the program, but there was no statistically significant difference. Female participants showed a statistically significant improvement in both KGDS and SRI-MF after the program (Table 6). This implies that the difference in the improvement of KGDS may be due to the fact that the prevalence of depressive symptoms for elderly women is higher than elderly men (Choung, 2015; Kwon, 2015; Yoon and Chang, 2019) due to the gap in emotional sensitivity caused by social and physiological conditions.

As a result of conducting the test of normality to analyze whether there is a difference in effects by age, the p value of S-W test was less than .05 in all cases except KGDS of the 50s and 60s, rejecting the null hypothesis, and thus data was tested using a nonparametric test. Even though the 50s satisfy normality as a result of the test, $n < 10$ and thus the nonparametric test is used, while KGDS of the

60s was analyzed with the t-test. KGDS and SRI-MF generally decreased after the program, but a statistically significant improvement was found only in the 60s for KGDS and only in the 70s for SRI-MF. Moreover, KGDS of the 70s somewhat increased after the program (Table 7). This result requires reexamination of the relevant age group in terms of content or operation of the program. Furthermore, in carrying out the program for the elderly, it is necessary to consider that there is a clear difference in social environment and physical activity among different age groups. Thus, it is necessary to subdivide the age groups into more detailed categories to build consensus and operate adequate physical activities, thereby revising and supplementing the program to be more suitable for the relevant age group.

As a result of conducting the test of normality to analyze whether there is a difference in effects by chronic diseases, the p value of S-W test was less than .05, rejecting the null hypothesis, and thus data was tested using a nonparametric test. There was improvement in both KGDS and SRI-MF

Table 7. Changes in depression and stress before and after participation in forest therapy program for dementia prevention by age

Category		n	M	SD	Z	p
50s	KGDS	before	7.86	6.23	-1.367	.172
		after	4.43	3.69		
	SRI-MF	before	38.71	12.20	-1.153	.249
		after	32.43	13.16		
60s	KGDS	before	12.55	6.35	4.721 ^y	.000 ^{y*}
		after	5.95	4.57		
	SRI-MF	before	45.14	18.24	-1.931	.053
		after	36.10	16.19		
70s	KGDS	before	5.89	4.20	0.000	1.00
		after	6.11	7.02		
	SRI-MF	before	36.70	15.84	-2.333	.020 [*]
		after	31.90	10.88		
80s	KGDS	before	5.82	4.35	-1.874	.061
		after	2.91	2.34		
	SRI-MF	before	38.10	23.84	-1.272	.203
		after	28.90	6.45		

Note. KGDS= Korean form of Geriatric Depression Scale; SRI-MF= Modified form of Stress Response Inventory.

^yt-test was performed for the statistics, ^{y*} $p < .05$ by t-test.

^{*} $p < .05$ by Wilcoxon signed-rank test.

Table 6. Changes in depression and stress before and after participation in forest therapy program for dementia prevention by gender

Category		n	M	SD	Z	p
Male	KGDS	before	8.53	6.10	-1.115	.265
		after	6.22	5.96		
	SRI-MF	before	44.75	22.11	-1.733	.083
		after	36.10	16.08		
Female	KGDS	before	8.15	6.06	-3.695	.000 [*]
		after	4.70	4.77		
	SRI-MF	before	37.51	14.98	-3.012	.003 [*]
		after	31.05	10.35		

Note. KGDS= Korean form of Geriatric Depression Scale; SRI-MF= Modified form of Stress Response Inventory.

^{*} $p < .05$ by Wilcoxon signed-rank test.

Table 8. Changes in depression and stress before and after participation in forest therapy program for dementia prevention by presence of chronic diseases

	Category		n	M	SD	Z	p
With chronic diseases	KGDS	before	34	7.36	6.08	-2.834	.005*
		after		4.56	4.46		
	SRI-MF	before	34	38.33	17.99	-2.419	.016*
		after		31.15	11.65		
Without chronic diseases	KGDS	before	25	9.24	5.90	-2.318	.020*
		after		6.00	6.03		
	SRI-MF	before	25	40.48	16.30	-2.231	.026*
		after		34.48	13.96		

Note. KGDS= Korean form of Geriatric Depression Scale; SRI-MF= Modified form of Stress Response Inventory.

* $p < .05$ by Wilcoxon signed-rank test.

after the program, and the improvement was statistically significant in both participants with and without chronic diseases (Table 8). This indicates that the forest therapy program for dementia prevention was effective for not only participants with chronic diseases but also those without chronic diseases.

Conclusion

This study was conducted to verify the effects of a forest therapy program for dementia prevention on depression and stress. We carried out the forest therapy program for dementia prevention with participants in their 50s or older and measured their depression (KGDS) and stress response (SRI-MF), and as a result we found statistically significant improvement. As a result of analyzing the effects according to the site of the program, it was found that the participants in the National Center for Forest Therapy program in which the participants were recruited in association with the local elderly counseling center had the pretest scores of KGDS and SRI-MF within the normal range, and their scores decreased significantly in both. The participants in the Hoengseong SoopCheWon program in which the participants were recruited in association with the elderly nursing home tended to have mild depression and high stress response in the pretest scores of KGDS and SRI-MF, and both showed statistically significant improvement after the program. The improvement was more remarkable for par-

ticipants whose pretest scores were out of the normal range, and their posttest scores were improved to the normal level. This indicates that the forest therapy program for dementia prevention has positive effects on depression and stress response of participants aged 50s or older. As a result of analyzing the effects by general characteristics of the participants, male participants did not show significant improvement, whereas female participants showed statistically significant improvement in both KGDS and SRI-MF. By age, it was found that KGDS showed significant improvement only in the 60s, and SRI-MF only in the 70s. The 70s rather showed an increase in KGDS, which raises the need to reexamine the relevant age group in terms of the program's content or operation, and to subdivide the age levels more elaborately in running the program. As a result of analyzing the difference in effects by chronic diseases, the participants all showed statistically significant improvement in both KGDS and SRI-MF.

Onset of dementia is a highly critical issue at this point with such rapidly aging population, and the burden is increasing not only for individuals but also in terms of society and economy, which raises the need for dementia prevention more and more each day. Despite such need, there is still insufficient research on the effectiveness of forest therapy on geriatric problems, especially dementia prevention. Accordingly, this study has significance in verifying the effects of forest therapy on dementia prevention so that forest therapy can be used in elderly welfare, and laying the groundwork for increasing the applicability of forest

therapy by obtaining a place for dementia prevention as a field of forest therapy.

The limitations of this study are as follows. First, there was no reference group in evaluating the effectiveness of the program. Since this is effectiveness evaluation of the program carried out at the level of forest welfare, no subjects were excluded. Therefore, it is necessary to conduct various studies designed to clinically verify the effects of forest therapy on dementia prevention for more subdivided subjects. Second, this study only evaluated the effects of forest therapy on dementia prevention in the emotional aspect. Therefore, in addition to more subdivided affective research, various studies on cognitive and physiological effects must be conducted to more specifically develop and specialize the use of forest therapy for dementia prevention. Third, the tool for effectiveness evaluation was a survey and thus there were participants facing difficulty in evaluation due to use of paper. It is necessary to subdivide the age groups of the subjects when studying the elderly including dementia prevention. Since vision and intelligibility are deteriorated in older age groups, there may be difficulties in paper-based surveys. Therefore, it is necessary to use and develop evaluation tools fit for the studies on the elderly, and to conduct research on more subdivided age groups for more accurate effectiveness evaluation.

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