

A Preliminary Study Regarding Changes in Psychological, Cognitive and Physical Functions through Participation in Forest Therapy Programs for Dementia Prevention of the Elderly

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I. Introduction

- The average life expectancy rises as medicine develops, but accelerating aging leads to geometrical increase in medical welfare services and social cost
- According to National Institute of Dementia(2020), out of 7,718,616 the total number of the elderly aged over 65, the estimated number of the elderly with dementia accounts for 794,280 and the presumed prevalence of dementia turned out to be 10.3%
- Since it is difficult to cure dementia completely, the effort of preventing and managing the occurrence is primordial. Along with non-pharmacological treatment, there is growing interests in the healing method applying a variety of forest therapy factors

II. Methods

Overview of program operation

- Program : 「100 years old healing in the forest」 for elderly
- Target : experimental group(20 people) and control group(10 people) participants aged from 60-80
- Period: October 28th to November 3rd, 2019
- Place: National Center for Forest Therapy, Mumpil Village (Bonghyeon-Myeon, Yeongju-si, Gyeongsangbuk-do)
- Program Composition
 - Outdoor(10hours) : Forest hiking, Forest walking, Hammock, etc.
 - Indoor(10hours) : Hydro therapy, Tea meditation, Health massage, etc.



Measuring tools

- Measurement method
 - experimental group : measured before and after participation in the program
 - control group : measured before and after daily life for 6 nights and 7 days
- Psychological index : Anxiety(K-BAI), Depression(K-BDI), quality of life(SF-36)
- Physiological index : Cortisol, hs CRP, Melatonin, HRV, Blood pressure
- Cognition index : CERAD-K, CANTAB
- Statistical analysis
 - Analysis tool: Excel and SPSS 23.0 ver.
 - Analysis method
 - All tests were set to a significance probability of 0.05
 - Pre-homogeneity test : independent t-test, chi-squared test
 - Comparison before and after participation by indicator : paired t-test
 - The interaction effect of the two groups : repeated measures ANOVA

III. Results

Demographic characteristics

Variables	Experimental (n=20)	Control (n=10)	p
Female (%)	10 (50)	9 (90)	0.032
Age (Mean ± SD)	71.55 ± 5.82	72.70 ± 3.19	0.567
High school graduate or higher(%)	13(65)	6(60)	0.789
Hypertension diagnosis(%)	10(50)	5(50)	1.000
Diabetes diagnosis(%)	4(20)	2(20)	1.000
Hyperlipidemia diagnosis(%)	4(20)	4(40)	0.243
Healthy adults(%)	2(10)	2(20)	0.448

➢ It was confirmed that there was no significant difference in all items except for female ratio between the experimental group and the control group.

Psychological change analysis results

Expeimental Group	Average(SD)		Difference	t	p	
	Before	After				
Beck Anxiety Inventory	5.80(7.10)	3.95(6.67)	1.85	2.428	0.025	
Beck Depression Inventory	9.15(7.21)	7.40(7.25)	1.75	1.685	0.108	
SF-36	physical functioning	76.50(20.46)	77.50(19.83)	1.00	-4.199	0.000
	physical role functioning	55.00(35.91)	67.50(36.36)	12.50	-2.127	0.047
	mental health	75.20(3.74)	79.80(4.75)	4.60	-4.134	0.001
Control Group		Average(SD)		Difference	t	p
		Before	After			
Beck Anxiety Inventory		9.00(7.54)	8.90(6.17)	0.10	0.095	0.926
Beck Depression Inventory		13.30(9.19)	11.00(6.58)	2.30	1.591	0.146
SF-36	physical functioning	68.50(17.65)	66.50(18.66)	2.00	4.754	0.001
	physical role functioning	40.00(42.82)	42.50(39.18)	2.50	-0.631	0.726
	mental health	70.80(2.40)	66.40(3.47)	4.40	4.292	0.002

➢ The test results of psychological index of the experimental group manifested effectiveness in that the anxiety scale significantly reduced, while the scale of quality of life showed statistical significance in three categories of physical functioning, physical role functioning and mental health.

➢ There was no statistically significant change in the depression scale in both groups.

Physiological change analysis results

Expeimental Group	Average(SD)		Difference	t	p	
	Before	After				
Cortisol	7.48(2.69)	7.73(2.05)	0.25	-0.348	0.732	
hs CRP	2.31(4.18)	1.98(3.39)	0.33	0.362	0.722	
Melatonin	10.57(2.08)	10.05(1.18)	0.52	1.375	0.188	
HRV	Autonomic nerve activity	87.58(13.11)	92.97(20.14)	5.39	-4.292	0.002
Control Group		Average(SD)		Difference	t	p
		Before	After			
Cortisol		5.36(2.02)	6.70(2.84)	1.34	-1.824	0.101
hs CRP		0.85(1.33)	0.84(1.19)	0.01	0.185	0.858
Melatonin		9.35(1.28)	10.32(1.03)	0.97	-2.160	0.059
HRV	Autonomic nerve activity	89.05(27.47)	82.97(16.88)	6.08	0.786	0.452

➢ There were no statistically significant results in changes of cortisol and infection index through the blood test and melatonin through urine test. However, statistical significance was observed in autonomic nervous system activity regarding heart rate variability.

➢ There was no significant change in any items in the control group.

Cognition change analysis results

- Comparison of changes in CERAD-K J9 scores between two groups

CERAD Variables	Forest therapy program				Interaction effect		Bonferroni correction
	Before	Bonferroni correction	After	Bonferroni correction	F	p	
	Mean(SD)	p	Mean(SD)	p			
J9(path makingB-Z)							
Experimental	1.0 (1.0)	0.905	1.5 (0.6)	0.073	5.5	0.033	0.008
Control	1.0 (0.6)		0.8 (0.9)				0.482

- The results of the experimental group t-test by CANTAB

Variables	Before	After	SD	t	p
MOTML	1037.7	903.2	207.20	2.903	0.009
SWMBE4	1.6	0.7	2.00	2.111	0.048
RVPA	0.8	0.9	0.00	-3.576	0.002

➢ According to the CERAD-K test studying the difference between the two groups, significant changes between the two groups were observed in the categories of path making B

➢ In the case of the CANTAB test, three categories showed a significant effect in the experimental group.

IV. Conclusions

- As a preliminary study aiming at inquiring into the effects of forest therapy programs on prevention of dementia and improvement of cognitive skills, this study was carried out by dividing into three categories of psychological test, cognitive ability test and biomarker test.
- The experimental group demonstrated statistically significant and positive changes in six indexes out of ten index test results. Through the results, it was possible to deduce effectiveness of forest therapy programs of six nights and seven days.
- The main study that will be conducted in the future will inquire about the medical and scientific effects of forest therapy through a variety of research designs in the long term, and it is expected that the future study will serve as an alternative to prevention of dementia.