

Effects of Forest Therapy Programs on the Psychological and Physiological Improvement of Firefighters

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I. Introduction

- Firefighters are constantly exposed to dangerous incidents of fire suppression, emergency relief and first aid activities.
- They go through posttraumatic stress disorder by terrible incidents and disasters, and long-term stress leads to depression threatening their mental health.
- This study was carried out with the purpose of inquiring into effects of the experience of forest therapy programs of four nights and five days obtained in a psychological and physiological perspective, oriented to firefighters who are mentally and physically tired by stress from urgent and dangerous field works and long-term shift works.

II. Methods

Summary of program

- Program: 2019 「Stress Resilience Enhancement Program」 (5days 4nights)
- Subject : 108 firefighters
- Period : April 15, 2019 to July 19, 2019 (4 times in total)
- Site : National Center for Forest Activities in Hoengseong, Korea
- Composition
 - Outdoor : Activities using natural objects (3 types)
 - Indoor : Activities such as building a tower using wooden sticks (5 types)



Materials

- Measurement method : Survey conducted before and after participating in forest experience activities
- Psychological index : Post-Traumatic Stress Disorder(PTSD) Checklist
Quality Of Sleep(QOS) / Profile Of Mood States(POMS)
- Physiological index : Heart Rate Variability(HRV)

Statistical analysis

- Analysis tool: SPSS 24.0 ver.
- Analysis method
 - Data analysis of 66 people excluding unfaithful responses
 - Demographic characteristics : Descriptive statistical analysis
 - Comparison before and after participation by indicator: Paired *t*-test

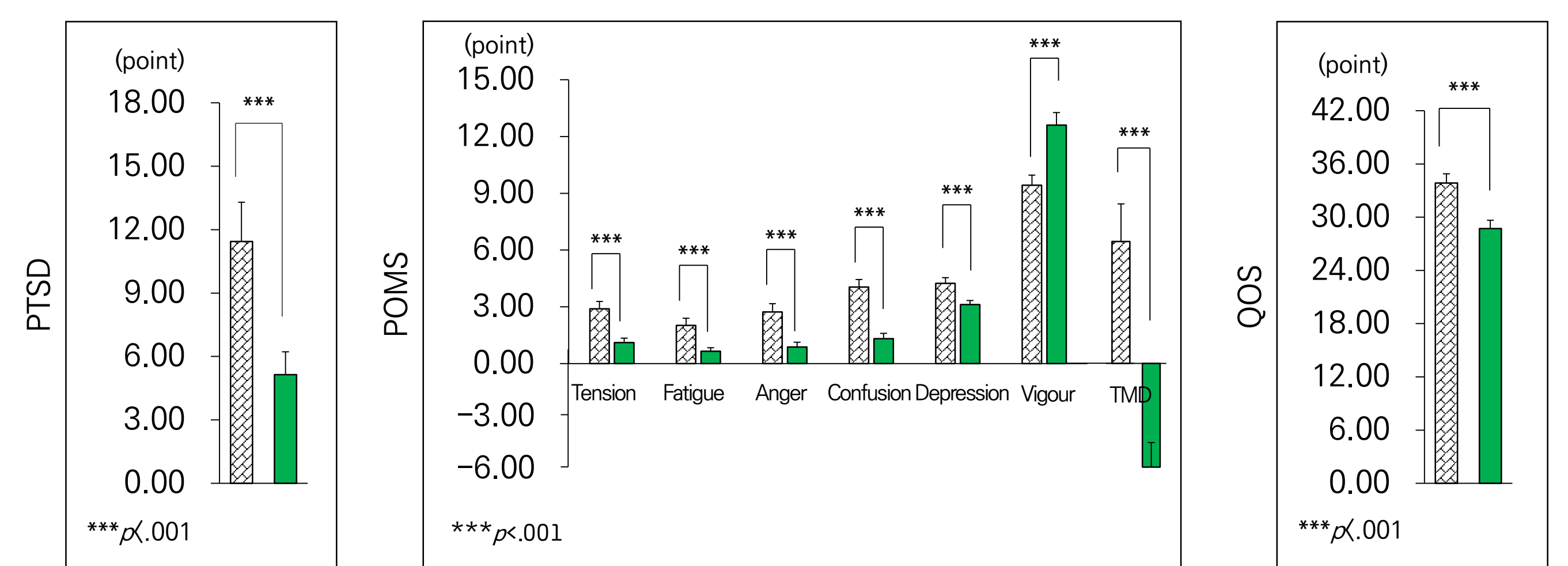
III. Results

Demographic characteristics

Variables	N	(%)	Variables	N	(%)	Variables	N	(%)			
Sex	Man	59	89.4	Smoking	Smoking	24	36.4	Aver. Sleep time	≤ 5hrs	13	19.7
	Woman	7	10.6		Non-smoking	42	63.6		6hrs	24	36.4
	Subtotal	66	100.0		Subtotal	66	100.0		7hrs	18	27.3
Age	20s	9	13.6	Drinking Frequency	None	10	15.2		8hrs	10	15.2
	30s	26	39.4		1/week	19	28.8		9hrs ≤	1	1.4
	40s	21	31.8		2~3/week	21	31.8		Subtotal	66	100.0
	50s	7	10.6		4~/week	1	1.5	1~2/week	15	22.7	
	60s ≤	3	4.6		1~2/month	15	22.7	1~2/month	20	30.3	
	Subtotal	66	100.0		Subtotal	66	100.0	1~2/6months	14	21.2	
	Exercise Frequency	None	2		3.0	Time to stay in the forest	< 30min	16	24.2	1~2/year	8
1~2/week		15	22.7	30min~1hr	28		42.4	None	9	13.7	
2~3/week		30	45.5	1~3hrs	16		24.2	Subtotal	66	100.0	
4~/week		19	28.8	3~5hrs	6		9.2				
Subtotal		66	100.0	Subtotal	66		100.0				

Psychological change analysis results

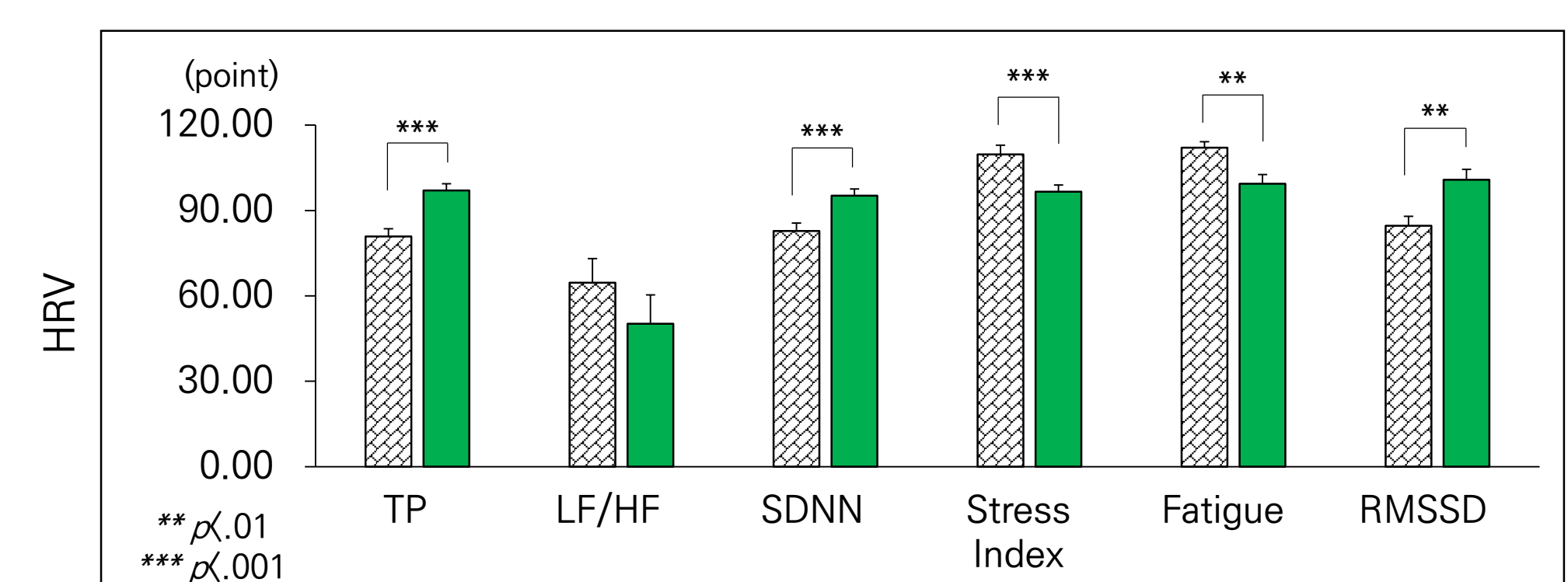
- Results of PTSD, QOS, POMS Before and After the program (▨ Before ■ After)



- According to the analysis of psychological index, post-traumatic stress disorder reduced from 11.44 to 5.14, showing statistically significant changes ($p < 0.001$).
- As for mood states, the TMD decreased from 6.50 to -5.53 ($p < 0.001$). On the other hand, quality of sleep diminished from 33.85 to 28.73, manifesting statistically significant improvement ($p < 0.001$).

Physiological change analysis results (▨ Before ■ After)

- Results of HRV Before and After the program



- As a result of HRV analysis, TP, SDNN, and RMSSD increased to a statistically significant difference after participating in the program ($p < 0.001$).
- Stress index ($p < 0.001$) and Fatigue ($p < 0.01$) are reduced by statistically significant difference.

IV. Conclusions

- This study verified that forest therapy programs contributed to relieving stress of firefighters, increasing their physical and psychological stability, and improving quality of sleep.
- The research results expect that forest therapy programs can be applied as a base data to strengthen stress resilience of firefighters and prevent their post-traumatic stress disorder.
- Furthermore, long-term measurement and analysis of firefighters are needed to improve the reliability of the results of psychological and physiological index.