Effect of forest therapy on psychological stress and emotion of aircrew

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Abstract: The objective of this study conducted from April 2021 to May 2023 was to investigate the psychological relaxation and emotion regulation effects of a forest therapy program on Chinese aircrew, including pilots, flight mechanics, and flight correspondents, who were convalescents admitted to our hospital. A total of 30 individuals in the experimental group underwent a half-day forest therapy program, while another 30 individuals in the control group underwent a similar half-day program conducted in a square and indoor setting without any forest environment. Prior to the forest therapy, there were no significant differences between the two groups. However, after the intervention, the experimental group showed a significant decrease in their Perceived Stress Scale (PSS) scores, while the Profile of Mood States (POMS) scores decreased in the test group and increased in the control group. In conclusion, this study demonstrates that forest therapy has a positive impact on the psychological well-being and emotional adjustment of Chinese aircrew.

1. Introduction

The aviation working environment, flight operations and training tasks require high physical fitness, reaction and adaptability. Moreover, they have to always be alert to the threat of unpredictable fatal accidents. Therefore, aircrew members are faced with more psychological pressures and mood swings. Studises show that aircrew suffer from the effects of a long-term exposure to mental stress and this exposure can lead to imbalances in both hormonal and neural regulatory systems[1]. Long-term exposure to such pressure would result in occupational burnout; A type of physical and mental state of extreme fatigue[2]. If the daily health care measures are not appropriate, the bad lifestyle such as smoking, drinking, partial eclipse, irregular work and rest and external adverse factors will easily make the aircrew in a sub-health state. How to effectively relieve the pressure and improve their mood is of great significance to improve their working ability.

Forest therapy was developed in Japan as “shinrin-yoku”, which translates to “forest bathing”[3]. This concept was introduced to China in 2012 by the Beijing Municipal Bureau of Landscaping. Experts and scholars have made in-depth research on the monitoring of negative air ions in forest parks and the volatile substances of forest plants, which provides an important scientific basis for the utilization of forest health care resources and the selection of plants in forest sanatorium.In general, there is significant data that shows the benefits of forest restoration to human health. Studies have shown that forest therapy does have the ability to mitigate harms caused by stress[4],[5].

Therefore, this study was to investigate the role of forest therapy in psychological relaxation and emotion regulation in Chinese pilots.

2. Research method

2.1. Research objects

Aircrewmen (including drivers, pilots, flight mechanics and flight correspondents) admitted to our sanatorium from April 2021 to May 2023 were divided into two groups, 30 cases in test group

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and 30 cases in control group. The participants were 25 to 50 years old (34.80 ± 5.71) in study group, while 26 to 51 years old (35.31 ± 4.22 years) in control group.

2.2. Method

Test environment: Our sanatorium is adjacent to Xingcheng Beach, Liaoning Province, China. There is over 40 acres of natural forest mainly composed of Chinese pine. In addition to pine trees, forests also include oak, maple, apricot, jujube, pear, thorn, platycodon grandiflorum and so on. The test temperature is about 18-21℃, the relative humidity is 64%, the wind force is less than level 3, the air pressure is 1.015×10^5Pa.

30 cases in the experimental group were treated with half-day forest therapy (Table 1).

Table 1 Test group process

Order	Items	Time	Ground point
1	Distributing invitations	Test day eve	Recuperation room
2	Introduce the forest medical role while walking	20 minutes	Forest entrance
3	Walking briskly at a speed of 70-90 meters/min	30 minutes	Forest walking path
4	Fingers exercises while walking	20 minutes	Forest walking path
5	Lying on a chaise longue or on the ground and meditate in music	30 minutes	Forest Square
6	Making paintings with branches, leaves and flowers	45 minutes	Sunshine room in the forest
7	Singing two songs heartily in the forest	15 minutes	Forest walking path
8	Yelling ‘Ah’ as long as you can three times	10 minutes	Forest walking path
9	Watering and saying thanks to a plant together	10 minutes	Forest exit

The control group (30 cases) was treated with the same model for half a day in the square and indoors without forest (Table 2).

Table 2 Control group process

Order	Items	Time	Ground point
1	Distributing invitations	Issue one day in advance	Recuperation room
2	Introduce the role of community therapy while walking	20 minutes	Community entrance
3	Walking briskly at a speed of 70-90 meters/min	30 minutes	Community main road
4	Fingers exercises while walking	20 minutes	Community main road
5	Lying on a chaise longue or on the ground and meditate in music	30 minutes	Community square
6	Making paintings with branches, leaves and flowers	45 minutes	Community activity room
7	Singing two songs heartily in the forest	15 minutes	Community main road
8	Yelling ‘Ah’ as long as you can three times	10 minutes	Community main road
9	Shake hands and thank the community workers	10 minutes	Community exit

2.3. Observation index

Before and after the experiment, the Perceived Stress Scale(PSS-14), the profile of mood states(POMS) were asked to be completed.

The PSS is a self-reported measure which is an effective scale used to measure the stress in one’s

life and it has a total score of 56 points, with a high score indicating greater perceived stress.

The POMS[6] is a proven way to assess psychological distress and mood through factor analysis. It includes seven subscales: fatigue, anger, vigour, tension, esteem, confusion, depression and total mood disturbance(TMD).

There are 40 items[7]. The words belonging to each sub-scale are mixed and arranged. Each answer has five grades: the numbers 1 to 5 represents nothing, a little, moderate, a lot and always in sequence. The subjects were asked to choose a corresponding grade that best suits their own mood. Most subjects were asked to finish it in 3-5 minutes.

2.4. Statistical treatment

The scales of recuperators before and after forest therapy intervention were analyzed by SPSS 25.0 software and then handed over to professional doctors for analysis and evaluation.

3. Results

3.1. The PSS-14 scale

The results of PSS-14 showed both groups have a decrease, but the experimental group showed a significantly greater decrease than the control group. (Table 3)

Table 3 PSS-14 scores in two groups between two groups before and after forest therapy

Scale	Measurement time	Group	Total scores	P value
			Mean±SD	
PSS-14	Before test	Forest group	26.19±4.16	-
		Community group	25.18±4.62	0.12
	After test	Forest group	19.43±6.97	-
		Community group	23.50±5.38	< 0.001

3.2. The POMS score comparison

Two groups were no significant difference in POMS before the forest therapy ($P > 0.05$), but the POMS score was decreased in the test group and increased in the matched group ($P < 0.05$). (Table 4)

Table 4 POMS scores before and after forest therapy

group	n	Total mood disturbance(TMD) scores (Mean±SD)	
		Before treatment	After treatment
test team	30	78.50±5.98	71.52±4.39
control group	30	76.57±3.58	84.55±5.42
T value		1.136	2.545
P value		0.128	0.013

4. Discussion

Forest therapy is a new interdisciplinary subject integrating medicine, landscape architecture and ecology. The emergence of forest therapy is not accidental, but a pursuit of health and spiritual quality. Forest is the longing for an ideal life, and health is the prerequisite for having all the good things[8]. With the popularization and application of forest therapy in China, domestic scholars have increased their research on forest therapy. Discussion on the research methods of forest convalescence is helpful to confirm its implementation effect, guide the planning and design of forest therapy ground, study the subjects and forms of forest tests, carry out various forest convalescence projects and enrich the forms of activities according to different target groups.

People feel comfortable in the natural environment because their various physiological functions are generated and evolved under the influence of the natural environment. Compared to the millions of years of human evolution, the history of humans entering modern cities through the Industrial

Revolution is only four hundred years old. That is to say, humans spend 99.9999% of their time living in forests. Therefore, humans have the most primitive and simple familiarity with forests and trees. Whenever humans are troubled by the "urban civilization disease", walking into the forest and returning to nature can provide comfort to the human soul.

The medical effects of forest therapy on the human body mainly include two aspects. Firstly, the unique microclimate and microenvironment of forests have medical effects on the human body. Forest microclimate refers to the phenomenon where the climatic conditions in a forest are inconsistent with the external environmental climate, which is mainly the result of the interaction among sunlight, air, and various plants under the canopy. The forest will accumulate high levels of Phytoncide and Negative Oxygen Ions, which will naturally restore the human body. In addition, specific therapies that have a medical impact on the human body, such as physical therapy, occupational therapy, art therapy, aroma therapy, etc.

Aircrew members are a special group who have been subjected to long-term psychological and physiological pressure. The healing effect of forests can provide assistance in improving their psychological stress and emotional state. Therefore, exploring the relief effect of forest therapy on psychological stress symptoms of crew members and comparing the differences in urban and forest environmental health levels has important practical significance[9],[10].

In this experiment, we integrated different therapies into the treatment plan based on the characteristics of the flight crew, thereby further improving the effectiveness of forest therapy. In the initial introduction session, we used Five Sense Therapy to guide participants in perceiving nature using a single sense (including vision, touch, smell, hearing, and taste). The Forest Walking and Forest Fingers Health Exercises we use belong to physical therapy, which is a treatment method that achieves functional exercise through systemic and local aerobic exercise. Forest Fingers Health Exercises is a popular traditional Chinese medicine therapy that not only exercises finger flexibility, but also plays a role in clearing meridians. Forest Meditation is a rest and relaxation therapy that promotes relaxation and eliminates body tension through soothing music. Leaf Painting is a form of expressive art therapy and also a commonly used psychological therapy method. Forest Singing and Forest Shouting mainly rely on music therapy and catharsis therapy to help participants release emotions in nature. Finally, we guide participants to water the forest, strengthen the connection between humans and nature, and provide positive feedback.

This study indicates that forest therapy has better effects in regulating stress and emotions compared to communities. The changes in scores on scales such as PSS-14 and POMS intuitively demonstrate the improvement effect of forest therapy on the psychological stress and emotional state of flight attendants. However, this study does have limitations. Firstly, the sample size is small, and secondly, the research methods are all subjective scales, lacking objective indicator support. In the following studies, more samples will be included and suitable serum markers will be selected for inclusion in the study.

5. Conclusions

To sum up, forest therapy has a positive impact on the psychological and emotional adjustment of aircrew. It can help aircrew relieve negative emotions, reduce incorrect emotional coping styles and promote the physical and mental health of aircrew. In the future recuperation work, we should make full use of the environmental advantages of our hospital, carry out more forest therapy treatment projects during the aircrew recuperation, and make greater efforts to relieve the psychological pressure of the aircrew, so as to maximize their physical and mental health during the recuperation.

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