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Effects of Stone Spa (*Ganban-yoku*) on Psychological States

KEYWORDS: Stone Spa; Induced hyperthermia; Mood; Anxiety

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ABSTRACT

This uncontrolled intervention study explored the effects of stone spa use on the psychological states of women. Sixty-eight female volunteers (mean age 37.5 years (standard deviation 14.8)) recruited at a women-only stone spa facility participated in the study. They completed the short-form Profile of Moods States (POMS) and the State-Trait Anxiety Inventory (STAI) before and after stone spa use in order to determine changes in mood and anxiety states. Six factors relating to mood were measured using the POMS: Tension-Anxiety, Depression-Dejection, Anger-Hostility, Vigor, Fatigue, and Confusion. The two anxiety concepts of state anxiety and trait anxiety were also measured. The scores for Tension-Anxiety and Anger-Hostility and both anxiety measures were improved statistically after stone spa use. Stone spa use shows considerable promise for improving mood and reducing anxiety. Since this study was a descriptive, prospective and uncontrolled intervention study, further investigation of these promising findings is warranted.

KEYWORDS

Stone Spa; Induced hyperthermia; Mood; Anxiety

BACKGROUND

Japan has long enjoyed many hot springs, and there are currently around three thousand sites.[1] Hot springs have been a familiar practice of alternative medicine for Japanese to improve their health, and it is a popular leisure activity. Among hot spring resorts, some also provide heat baths where visitors lie on a mat over a spot of geothermally warmed ground to heat their bodies.[2] Most hot spring sites with natural heat baths are located in remote mountains away from urban areas, and it is therefore not convenient to enjoy them. However, over the past several years, amenities called stone spas (*ganban-yoku* in Japanese) have emerged in urban settings as facilities where people can easily enjoy pseudo heat baths. These artificial stone spas have been rapidly expanding in number, and there are currently about 1,500 facilities across the country.[3] In 2008, 11.6 million people used these facilities, and the market size reached 110 billion yen (about 800 million pounds), making the stone spa a very popular alternative medicine practice or leisure activity.[4] The stone spa does not use hot water, but beds made of rock processed into slabs. Users lie on the rock beds warmed by heaters underneath in order to stimulate perspiration. The convenient stone spas are highly popular, especially among women, due to the beauty and health benefits they confer.[4]

While the number of stone spa users is rapidly rising, studies regarding the effects of stone spa use on the human body have rarely been conducted. This primary research aims to investigate the effects of stone spa use on the psychological states of women, who tend to be the main users of stone spa facilities.

METHODS

Research design

An uncontrolled intervention study (pre- and post- comparative design) was conducted.

Subjects

In February 2008, healthy female volunteers were recruited for the study at a women-only stone spa facility located in Shizuoka prefecture. After providing oral and written explanations of the study protocol and obtaining consent for participation, a total of 68 subjects completed valid questionnaires for analysis. Among them, 59 subjects were users at a stone spa facility, and 9 subjects were users at a nursing home using a mobile stone spa under the same conditions as a stone spa facility.

Survey Period and Administration

Surveys were administered from February through August 2008. Self-administered questionnaires were used to collect basic respondent information such as name, age, sex, and number of prior experiences using a stone spa. In addition, before a stone spa session intervention, subjects were asked to complete the short-form Profile of Mood States (POMS)[5] to assess mood levels, and the State-Trait Anxiety Inventory (STAI)[6] to assess anxiety levels. When completing the short-form POMS, subjects were asked to consider their mood “at the present time.”[5]

Each subject then changed into a bathrobe and experienced a stone spa session (see Figure 1). The stone spa, with beds made of rock processed into slabs and heated from below, was maintained at a temperature of 39.0°C and humidity of 75% (stone spa facility) and 55% (nursing home). Each subject freely reclined on the heated bed and warmed their body. The room temperature was maintained at 34.0°C using an air conditioner. The bed surface and room temperature and the humidity were measured by thermometers (HIOKI; HIOKI3442) and digital thermo-hygrometers (Tanita; TT-532), respectively.

After using the stone spa, subjects were asked in a self-administered questionnaire to note the duration of their session on the study day. In addition, they were again asked to complete self-administered versions of the short-form POMS and STAI. After the investigation, pre- and

post-questionnaires of each subject were matched, and their names were then removed to anonymize the data.

Data analysis

The number of subjects, age, sex, prior experience of stone spa use, and the duration of the stone spa sessions were simply tallied, and their distributions were observed.

Using the short-form POMS, the scores for each of the six measurement factors of mood for Tension-Anxiety, Depression-Dejection, Anger-Hostility, Vigor, Fatigue, and Confusion were calculated and converted to *T*-scores, and the means and standard deviations (SD) were calculated. The pre-post *T*-score change and its 95% confidence interval (CI) were calculated and examined using a paired *t*-test. STAI scores of state anxiety and trait anxiety were calculated, and the pre-post change was similarly examined. SPSS 15.0J was used for analysis, with differences at $P < 0.05$ considered as statistically significant. Questions with missing data were excluded from the analyses.

Ethical considerations

Prior to conducting the study, the study protocol was approved by the Institutional Review Board of Hamamatsu University School of Medicine (No. 19-101). Having explained the study with written statements that were approved by the board, we initiated the study with participants who provided us with signed and voluntary informed consent. The present study was registered as ID000001433 by the University Hospital Medical Information Network Clinical Trials Registry (UMIN-CTR) in Japan.

RESULTS

A total of 68 persons participated in this study, and consent forms were obtained from all of them.

During this study none of the subjects became ill.

Basic subject data

The 68 subjects were all female, with a mean age of 37.5 years (SD 14.8). Among 64 subjects who provided valid responses, 42 subjects (65.6%) had prior experience using a stone spa, with a mean number of previous experiences of 9.1 (SD, 17.3), and 22 subjects (34.4%) had no experience.

Regarding duration of the stone spa session on the study day, 17 (27.0%) out of 63 subjects reported it lasted 40-49 minutes, which was the most often mentioned category (Table1).

Results of the short-form POMS

Each *T*-score of the six factors for mood and the pre-post change after stone spa use were examined.

The scores for Tension-Anxiety and Anger-Hostility decreased significantly, showing an improvement in mood. Although statistically not significant, the scores for Depression-Dejection, Fatigue, and Confusion also decreased, and the scores for Vigor increased, also showing improvement in mood (Table 2).

Results of the STAI

The scores for state anxiety and trait anxiety, and the pre-post changes after stone spa use were examined. Both scores on state anxiety and trait anxiety decreased significantly after stone spa use, showing improvement in anxiety (Table 2).

DISCUSSION

To explore the effects of stone spa use on psychological states, this uncontrolled intervention study was conducted with 68 volunteer subjects who consented to participate. Psychological states were examined before and after stone spa sessions, using the short-form POMS and the STAI. Results of this study demonstrate that stone spa use may have a positive impact on psychological states.

Large deviations were not observed in distributions of scores for the six mood factors before stone spa use.[5] Distributions of STAI scores for state anxiety and trait anxiety also did not show large pre-session deviations.[6] All six mood factors measured in the short-form POMS demonstrated tendencies toward improvement after stone spa use, and the Tension-Anxiety and Anger-Hostility factors were improved significantly. The STAI factors of state anxiety and trait anxiety also demonstrated improvement after stone spa use.

The main purpose of stone spa use is the hyperthermia effect using heat transmitted from a warmed floor and radiant heat, which differs from hot water bathing. As stone spa use does not use hot water, it does not entail any burden from water pressure exerted on the body. In this respect, stone spa is similar to far-infrared dry sauna. The results of this study regarding improvement in mood and anxiety concur with reports from previous studies using far-infrared radiation equipment by Yatsuzuka et al.,[7] and charcoal kiln sauna bathing by Hayasaka et al.[8] Yatsuzuka et al. speculate that these results may be attributable to recovery from fatigue by heat shock protein (HSP)70,[9] an increase in cellular immunity,[10] and changes in biochemical and serologic test values.[11] Other studies have reported that far-infrared dry sauna is effective for improving chronic pain,[12] relaxation,[13] sleeping disorder,[13] and remedial effects of cardiac failure,[14] and all are thought to be attributable to the hyperthermia effects of heating. Studies in the nursing care field have reported that localized heating of parts of patients' bodies is effective in improving quality of life.[15] In addition, while stone spas were originally created by imitating natural heat baths at hot spring sites,[3] the trend for mood

improvement induced by heat spa use at these sites has been recognized.[16]

With regards to anxiety, state anxiety and trait anxiety were also evaluated in this study using the STAI. State anxiety and trait anxiety both showed significant improvements after thermal bathing, and in particular, state anxiety was markedly improved. State anxiety reflects a transient state at the time of assessment, while trait anxiety is associated with individual differences in the comparatively stable feature of anxiety.[6] Tension-Anxiety on the POMS reflects transient mood at the time of assessment[5] and is considered similar to state anxiety measured on the STAI. The findings of this study also demonstrate similar results regarding Tension-Anxiety on the POMS and state anxiety on the STAI. Accordingly, it is likely that anxiety improves after stone spa use. This study investigated changes in anxiety levels over a short period, and it is reasonable that the degree of improvement in state anxiety, which reflects transient mood, was larger than that for trait anxiety, which reflects the stable feature of individual anxiety.

There are some limitations of this study. First, it was a cross-sectional intervention study with no control group and therefore, it cannot be denied that the trends for improvement in mood such as anxiety, tension, anger, and hostility could be due not to stone spa use but simply to reclining. Since reliability and validity of the short-form POMS and the STAI have previously been confirmed,[5, 6] it is less likely that results were biased by measurement uncertainty. However, conducting randomized controlled trials are required. Second, there is a possibility that information bias was operative, that is, that the simple high expectation for stone spa benefits might have induced strong effects. Furthermore, the study subjects are all women since most stone spa users are women[4] and, consequently, results for men are unknown.

Despite these limitations, this study provides some insights into the effects of stone spa use. Given the rapid increase in the number of stone spa users in Japanese urban areas, and also the fact that over 26 million people desire to use them,[4] stone spas may flourish as a convenient practice of

complementary and alternative medicine to improve mood and reduce anxiety.

CONCLUSION

The effects of stone spa use on psychological states were investigated using the short-form POMS and STAI measures. Among the six mood factors, Tension-Anxiety and Anger-Hostility showed significant improvement after stone spa use on the short-form POMS, and state anxiety and trait anxiety also showed significant improvement after stone spa use on the STAI. On the basis of these findings, stone spa use shows considerable promise for improving mood and reducing anxiety.

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CONFLICTS OF INTEREST

The authors have no financial or personal relationships with persons or organizations that could inappropriately influence this work.

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TABLES

Table 1. Environment of the Stone Spa and Baseline Characteristics of Subjects

Environmental conditions of the stone spa		
bed temperature, °C	39.0	
air temperature, °C	34.0	
humidity (stone spa facility), %	75	
humidity (nursing home), %	55	
No. of subjects		
female	68	
Age (year), mean (SD)	37.5	(14.8)
Experience of stone spa, n = 64		
With experience	42	(65.6%)
Without experience	22	(34.4%)
No. of prior experiences of stone spa, n = 42		
1	11	(26.2%)
2	8	(19.0%)
3	3	(7.1%)
4	4	(9.5%)
5 or more	16	(38.1%)
Duration of stone spa use in this study (mins), n = 63		

10-19	1 (1.6%)
20-29	4 (6.3%)
30-39	3 (4.8%)
40-49	17 (27.0%)
50-59	12 (19.0%)
60-69	8 (12.7%)
70-79	10 (15.9%)
80-89	5 (7.9%)
90-	3 (4.8%)

Data are presented as No. (%) unless otherwise specified. Percentages do not always sum to 100 due to rounding.

Table 2. Changes in Profile of Mood States and State-Trait Anxiety scores after stone spa use

	Before			After		Change (after - before)	<i>P</i> value ^b
	n	Mean	SD	Mean	SD	Mean (95% CI) ^a	
POMS (T-score)							
Tension-Anxiety	66	49.6	9.5	46.3	9.0	-3.2 (-4.9 to -1.6)	<0.001
Depression-Dejection	64	50.7	10.1	49.8	10.5	-0.8 (-2.4 to 0.7)	0.295
Anger-Hostility	64	51.2	10.7	49.4	11.4	-0.8 (-3.4 to -0.1)	0.035
Vigor	66	46.7	9.5	47.5	10.7	0.7 (-0.7 to 2.1)	0.312
Fatigue	65	50.8	9.9	49.3	10.8	-1.6 (-3.6 to 0.4)	0.122
Confusion	65	54.5	10.5	54.1	11.1	-0.9 (-2.3 to 1.3)	0.602
STAI							
State Anxiety	62	41.7	7.7	32.0	7.4	-9.6 (-11.6 to -7.7)	<0.001
Trait Anxiety	59	50.0	9.9	46.8	10.8	-3.2 (-4.8 to -1.7)	<0.001

^a95% confidence interval.

^b*P* value is calculated by paired t-test.

CAPTION

Figure 1. A stone spa (Photograph approved for publication by participant).

