A Study on Effect of Singing Bowl Sound Meditation on Body Relaxation

Seong-Yeon Jang[1] and Myung-Sun Lee[*2]
[1]postgraduate student Department of Beauty health care, Daejeon University, Korea
[*2]professor Department of Beauty Design, Daejeon University, Korea
Jsjan113@hanmail.net[1], laura2711@naver.com[*2]

Corresponding author:
laura2711@naver.com

Abstract

The Singing Bowl, a bowl-shaped tool originating from Tibet, India, and Nepal, emits sounds that relax the body through synchronization. Singing Bowl sound meditation is a therapy that combines these sounds and meditation. This study was conducted to investigate the effect of Singing Bowl sound meditation on brain waves and pulse waves, which are physiological indicators. The Singing Bowl sound meditation and music relaxation were applied to experimental and control groups just once for 20 minutes. The results showed that there were statistically significant changes in physiological indicators related to stress and anxiety in the experimental group compared to the control group. It is expected that various relaxation programs using the sound of singing bowls will be activated in the future.

Keywords: *Singing Bowl, Sound Meditation, Relaxation, EEG, Pulse Wave, Average Pulse Rate, Stress*

1. INTRODUCTION

A state in which the activity of the sympathetic nervous system is significantly low is generally referred to as relaxation. Relaxation is divided into psychological and physiological aspects. Psychologically, relaxation refers to a state of calm with low levels of tension and anxiety, while physiologically relaxation refers to a state of low metabolism, including prominent theta and alpha waves compared to other brain waves, slow heartbeat, lower blood pressure, and muscle relaxation. The relaxation, additionally, returns the body to a balanced state through the relief of psychological distress such as stress [2]. Relaxation is defined, in this context, as 'a state in which physical tension is reduced and free from unnecessary worries and fears' [3]. People have been developing methods to reach a state of relaxation since ancient times, and relaxation training methods have been reported that it is not only effective in relieving stress, anxiety, and pain, but also effective in increasing the treatment adaptability of patients with high blood pressure, cardiovascular disease, or cancer [4, 5]. Therefore, in modern society overexposed to excessive stress, environmental pollution, and various diseases, the need for various explorations of relaxation is further increasing

Meditation, which has a history of thousands of years, is a mind-body training method helpful for relaxing the body and mind [1] and is a practice for physical and psychological rest. The meditation, in other words, keeps us in a state of relaxation by blocking physical and psychological stress. Herbert Benson (2003) stated that meditation is the process of intentionally reflecting on your body and mind, feeling what you experience in each moment, and accepting that experience and it may induce a relaxation response in the body [6].

Meditation, which has a history of thousands of years, is a mind-body training method helpful for relaxing the body and mind [1] and is a practice for physical and psychological rest. The meditation, in other words, keeps us in a state of relaxation by blocking physical and psychological stress. Herbert Benson (2003) stated that meditation is the process of intentionally reflecting on your body and mind, feeling what you experience in each moment, and accepting that experience and it may induce a relaxation response in the body [6].

Singing Bowl, which originated in Tibet, India, and Nepal, is a bowl-shaped instrument made of metals such as gold, silver, iron, mercury, lead, tin, and copper. Singing Bowl meditation is a sound healing

meditation based on the characteristic of sound vibration called the tuning phenomenon, a way for all vibrations of nature to naturally come together to create balance [7]. The deep, soothing sound of the Singing Bowl smoothes the flow of energy in the body through its effect on the cells of the human body and relaxes tension through a feeling of tranquility [8]. Ryu et al. (2023) claimed that the sound of singing bowls reduces stress and maintains body balance, thereby inducing muscle relaxation [9], and Jeon & Lee [2023] reported a conclusion that Singing Bowl sound healing contributes to the management of stress and relaxation in adults [10].

EEGs, an indicator that can be used to measure body relaxation, are electrical signals generated in the brain and consist of delta waves, theta waves, alpha waves, beta waves, and gamma waves [9]. Among them, beta wave, due to its wide range (13-30Hz), is subdivided into high beta (Relative High Beat: RHB), middle beta (Relative Middle Beta: RMB), and low beta (Relative Low Beta: RLB). Since beta waves, an indicator of activity ability level, are related to arousal and concentration, exposure to excessive stress activates the RHB frequency [11], and indulgence in distracting thoughts activates RLB. Another physiological indicator associated with anxiety and stress reduction includes the autonomic nervous system, where activation of the parasympathetic nervous system leads to a decrease in pulse and blood pressure, resulting in relaxation of the body [12]. In this context, the exploration of the effects of Singing Bowl sound meditation, which induces physiological and psychological responses, on beta waves and pulse rate, which indicate a state of brain hyperactivity, is considered to have a significance in developing method that promotes physical relaxation. The purpose of this study was, therefore, to provide academic data on therapies for the promotion of promote physical relaxation by investigating the effects of Singing Bowl sound meditation on physiological indicators in adults.

2. MATERIALS AND METHODS

2.1. *Subjects*

For the purpose, 24 men and women in their 30s and 40s living in S City, Korea were recruited. Those without a history of mental illness, current severe illness, and meditation experience within the past six months were considered to have voluntarily consented to the experiment and were randomly assigned to the experimental group (n=12) and control group (n=12).

2.2. *Procedure*

Procedures were as follows:

In order to enhance effectiveness of the personal variables of the subjects and sound meditation, the experimental and control group were divided into 12 groups of two people each, and a total of 12 experiments were conducted. The subjects, after arriving at the yoga center, the experiment site, naturally rested for ten minutes. As a pre-examination, EEGs and pulse waves were measured. Singing Bowl sound meditation was administered to the experimental group. The control group listened to Yuki Kuramoto's 'Meditation', Eric City's 'Three Gymnopedies', and Debussy's 'Moonlight' for 20 minutes, which were evaluated as works with high balance and completeness by Kim & Jeong (2010) [13]. After the test, EEGs and pulse waves were measured in both groups in the same way as before the experiment.

2.3. *Instrument*

2.3.1. EEGs Measurement

EEGs were measured using QEEG-8 FX (Laxtha Inc, Korea). The subjects sat in a chair, closed their eyes, and rested. Referring to the international standard electrode attachment method, electrodes were attached to a total of eight locations, including two prefrontal lobes, two frontal lobes, two temporal lobes, and two parietal lobes, and measurements were performed for two minutes. The measured EEG signal was analyzed using Telescan (brain wave analysis program), and data was acquired using EEG Brain mapping (3D brain mapping program) and Batch Processing. The ratio of relative alpha waves to relative beta waves (Relative Alpha Beta: RAB), which can indicate a state of relaxation, was calculated.

2.3.2. Pulse Waves Measurement

To determine the state of physiological relaxation, pulse waves were measured using UbioMacpa (Bio Sense Creative Co., Ltd, Korea). After shining light on the left index finger of the subjects placed on the device, the amount absorbed and reflected is converted into a signal and analyzed. UbioMacpa, a non-

invasive device, analyzes minute changes in the heart rate waveform, checks the response of the body's autonomic nervous system to stress, and tests the degree of aging of blood vessels based on the autonomic nervous system. This device has obtained a product patent (No. 10-0954817), medical device product approval (No. 13-262), and medical device manufacturing system certification (No. 3447). Based on its high reliability, it has been adopted in many studies, including Ryu (2022), Jeon (2017), and Lee (2022). In this study, average pulse rate and stress change, which are indicators of physiological relaxation, were calculated.

3. RESULTS AND DISCUSSION

3.1 *Analysis of RAB, RLB, RMB, & RHB*

Table 1 shows the analysis of the differences in RAB, RHB, RMB, and RLB between the experimental group that applied Singing Bowl sound meditation and the control group that applied music relaxation.

Table 1. Analysis of Differences in RAB, RHB, RMB, and RLB

Variables	Channel	Group		Z	p
		Experimental	Control		
RAB (Relative Alpha Beta)	Fp1	3.20±1.42	2.21±1.57	-1.905	.057
	Fp2	3.43±1.63	2.43±1.85	-1.473	.141
	F3	3.53±1.88	2.53±2.08	-1.501	.133
	F4	3.50±1.97	2.59±2.26	-1.443	.149
	T3	1.90±1.37	1.49±0.90	-0.577	.564
	T4	1.69±1.17	1.45±1.26	-0.693	.488
	P3	2.25±1.11	1.57±1.15	-1.617	.106
	P4	2.14±1.63	1.31±0.73	-0.981	.326
	mean	2.71±1.33	1.95±1.38	-0.520	.603
RHB (Relative High Beat)	Fp1	0.08±0.04	0.12±0.06	-1.848	.065
	Fp2	0.08±0.04	0.12±0.06	-1.819	.069
	F3	0.07±0.04	0.13±0.07	-2.021	**.043**
	F4	0.07±0.04	0.13±0.08	-1.992	**.046**
	T3	0.12±0.06	0.17±0.08	-1.617	.106
	T4	0.12±0.04	0.18±0.09	-1.963	**.050**
	P3	0.1.0±0.04	0.16±0.07	-2.050	**.040**
	P4	0.13±0.06	0.16±0.05	-.386	.166
	mean	0.10±0.04	0.14±0.07	-1.963	.050
RMB (Relative Middle Beta)	Fp1	0.07±0.03	0.08±0.02	-1.011	.312
	Fp2	0.07±0.03	0.09±0.05	-1.272	.203
	F3	0.08±0.03	0.10±0.04	-1.098	.272
	F4	0.08±0.03	0.10±0,04	-1.127	.260
	T3	0.07±0.02	0.11±0.03	-0.298	.773
	T4	0.06±0.02	0.10±0.03	-1.300	.194
	P3	0.07±0.02	0.11±0.03	-1.242	.214
	P4	0.06±0.02	0.11±0.03	-1.242	.214
	mean	0.09±0.03	0.10±0.03	-1.848	.065
RLB	Fp1	0.05±0.02	0.06±0.03	-0.665	.506
	Fp2	0.05±0.02	0.06±0.03	-0.780	.435

(Relative Low Beta)	F3	0.06±0.02	0.06±0.03	-0.116	.098
	F4	0.05±0.02	0.05±0.03	-0.289	.773
	T3	0.07±0.02	0.07±0.03	-0.693	.488
	T4	0.06±0.02	0.06±0.02	-0.000	1.000
	P3	0.07±0.02	0.09±0.04	-0.173	.862
	P4	0.06±0.02	0.09±0.05	-1.011	.312
	mean	0.06±0.02	0.09±0.05	-0.433	.665

P<.05

The experimental group showed higher values than the control group in all eight channels and the channel average, but the differences were statistically insignificant. For RAB for each of the eight channels, the highest values were observed in the prefrontal cortex (Fp1, Fp2) and frontal lobe (F3, F4) of the experimental group. Since the RAB value is an indicator of the level of relaxation response to arousal response [14], the higher value of the experimental group compared to the control group may be interpreted as a relaxation response due to sound meditation. In addition, the results of this study are in the same context as the analysis reported in a study [15] that analyzed the effect of music listening activities on EEG that the activity of the frontal lobe region indicates deeper relaxation.

For the RHB, though there was no difference between the experimental and control groups in channels Fp1, Fp2, T3, and P4, the experimental group showed statistically significantly lower values than the control group in channels F3, F4, and P3. In addition, in channel T4, the experimental group showed marginally significantly lower values than the control group, and in the average of 8 channels, the experimental group showed marginally significantly lower values than the control group. RHB is associated with stress, anxiety, and tension. The significantly lower RHB observed in the F3, F4, T4, and P3 areas suggests that the Singing Bowl sound meditation relieved anxiety, stress, and tension in the experimental group, and is a significant result that just one application leads to a physiological relaxation phenomenon.

For the RMB, no differences between the two groups were observed in the F3, F4, T3, and T4 areas, and the experimental group showed lower values than the control group in the Fp1, Fp2, F3, F4, T4 areas and the average of eight channels, but the difference was not significant. For the RLB, no differences between the two groups were observed in the F3, F4, T3, and T4 areas, and the experimental group showed lower values than the control group in the Fp1, Fp2, F3, F4, T4 areas and the average of eight channels, but the difference was not significant

3.2 *Changes in Average Pulse Rate within and between groups*

Table 2 shows the analysis of the changes in average pulse rate within and between experimental that applied Singing Bowl sound meditation and the control group that applied music relaxation.

Table 2. Changes in Average Pulse Rate within and between two groups

Variables	**Average pulse rate**		**Amount of Change**	**Z[1)]**	**p-value[1)]**
	Before	After			
Experimental	80.58±8.92	75.58±7.75	5.00±7.40	-1.968	.049
Control	77.08±8.69	72.67±8.46	4.42±10.97	-1.138	.255
Z[2)]	-1.128	-0.957	0.000		
p-value[2)]	.266	.347	1.000		

[1)]Within group, [2)] Between group p<.05

In the control group, the average pulse rate tended to be lower after applying music relaxation compared to before it, but the change was statistically insignificant. In the control group, the average pulse rate tended to be lower after applying music relaxation compared to before it, but the change was statistically insignificant

The increase in blood inflow into blood vessels due to contraction of the heart results in rhythmic expansion of arteries, which is called pulse [16]. Pulse is a major vital sign of the human body related to blood pressure and breathing since it is caused by the beating of the heart. Activation of the sympathetic

nerves or increased secretion of norepinephrine and epinephrine from the adrenal medulla results in increases in heart rate, breathing rate, and blood pressure. On the other hand, separation of acetylcholine bonds or increase in parasympathetic nerves due to vagus nerve activation results in decreases in heart rate, breathing rate, and blood pressure [17]. In this context, a decrease in average pulse rate may be interpreted as the body's relaxation response. Jeon et al. (2022), who applied abdominal breathing to middle-aged women for 40 minutes at a time, reported the results that 'abdominal breathing does not have a significant effect on changes in pulse rate', which is different from that of this study [18]. Although the author did not provide an opinion on the results and the research method was different from this study, the results showed that sound vibration, rather than deep breathing, had a significant effect on body relaxation. Because there is a significant difference in the number of experimental sessions compared to this study, it will be valuable to compare the relaxation effects of sound meditation and abdominal breathing by applying the same number of sessions in the future. Fig. 1 is a schematic diagram of the change in average pulse rate of the experimental and control groups.

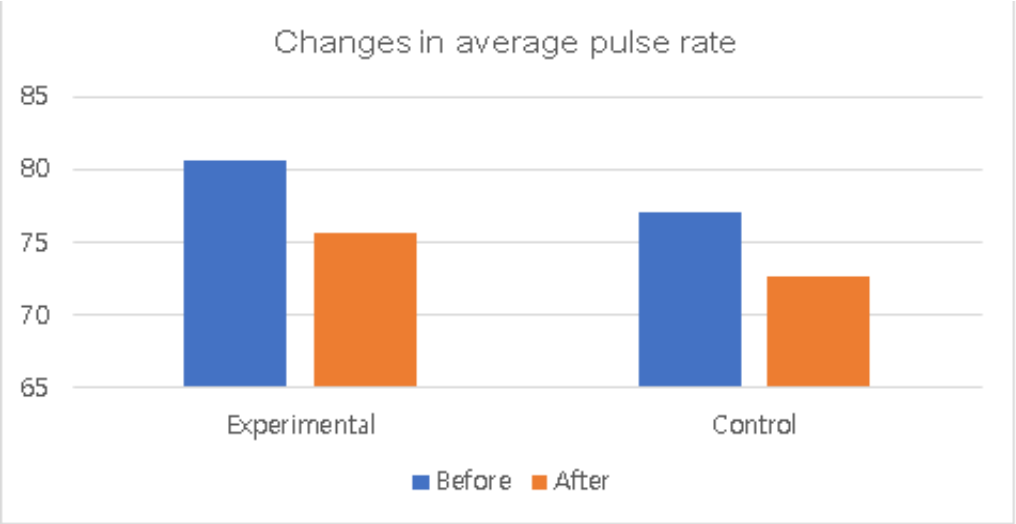

Figure 1. Changes in average pulse rate of the experimental and control groups

3.3 *Changes in Average Stress Score within and between groups*

Table 3 shows the analysis of the changes in stress score within and between experimental that applied Singing Bowl sound meditation and the control group that applied music relaxation.

Table 3. Changes in Stress score Rate within and between two groups

Variables	Average pulse rate		Amount of Change	Z[1)]	p-value[1)]
	Before	After			
Experimental	52.58±8.97	44.50±11.34	8.08±12.81	-2.005	.045
Control	50.92±8.97	45.83±11.34	5.08±12.81	-1.177	.239
Z[2)]	-0.174	-0.290	-0.579		
p-value[2)]	.887	.799	.562		

[1)]Within group, [2)] Between group p<.05

The stress score of the experimental group that applied Singing Ball sound meditation decreased

statistically significantly, and the stress score of the control group that applied music relaxation also decreased, but the difference was not statistically significant. In addition, the difference in stress score and amount of stress change between the two groups before and after experimental treatment were lower in the experimental group than in the control group, but the difference was not statistically significant (Fig. 2). UbioMacpa used in this study calculates the stress index by combining heart rate distribution, pulse diversity, and autonomic nervous system balance (stress score=<24: almost no stress; 25-34: temporary stress; 35-44: initial stress; 45-59: weakened defense against stress due to repeated accumulation of temporary stress; =>60: chronic stress requiring consultation with an expert). In the experimental group of this study, the average stress score was lowered from 52.58 before treatment to 44.50 after treatment, indicating improvement in stress state. These results show that the abundant vibration and resonance of the Singing Bowl are transmitted to the body cells during the meditation process, and the body is regaining balance, suggesting the physiological relaxation effect of Singing Bowl sound meditation. Fig. 2 is a schematic diagram of the change in stress score of the experimental and control groups.

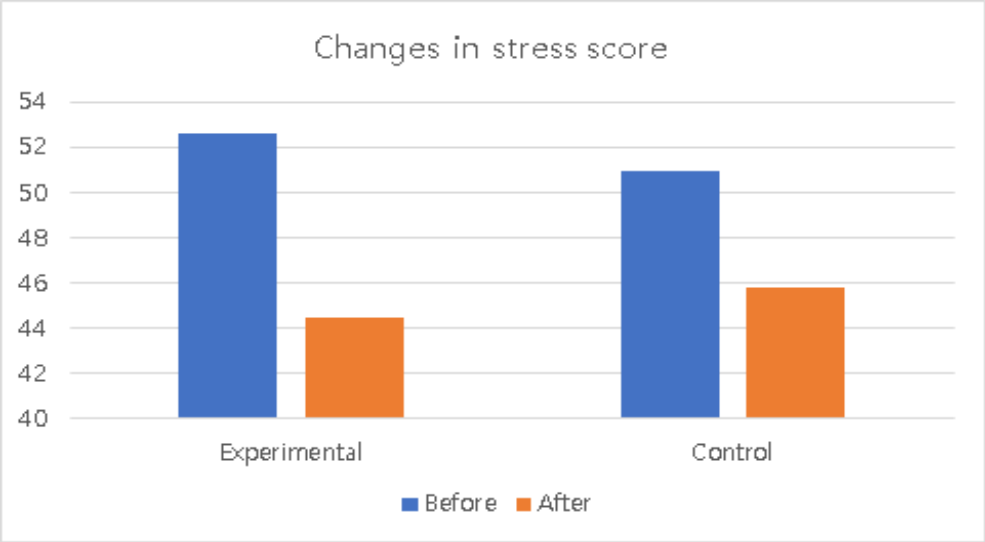

Figure 2. Changes in stress score of the experimental and control groups

4. CONCLUSION

This study intended to determine the effect of applying Singing Bowl sound meditation on physical relaxation in adults and based on the results, provide academic data to encourage active use of Singing Bowl sound meditation as a therapy to promote physical relaxation. For the purpose, 24 adult men and women were recruited. Singing bowl sound meditation was applied to the experimental group (n=12) and music relaxation was applied to the control group (n=12) for 20 minutes. EEG and pulse waves were measured before and after treatment, and the results are as follows.

First, the analysis of RAB, RHB, RMB, and RLB of the experimental and control groups showed that the average values of the F3, F4, T4, P3 areas and channels of the RHB channel in the experimental group were statistically significantly lower than those in the control group and that there was no significant difference between the experimental group and the control group in the RAB, RMB, and RLB channels.

Second, the analysis of pulse waves showed that pulse waves significantly decreased within the experimental group, but the difference in change between the two groups was not significant.

Third, the analysis of stress score showed that stress scores significantly decreased within the experimental group, but the difference in change between the two groups was not significant.

These results show that Singing Ball sound meditation has a significant effect on physiological indicators related to stress and anxiety and relaxes the body with just one application. This suggests that the heavy waves of Singing Bowl sound meditation help restore balance in adults who have lost physical and

emotional balance. It is expected, therefore, that programs that promote physical relaxation using Singing Bowl sound meditation will be revitalized. However, since this study was only a one-time experiment, it has the limitation of not being able to predict the results of long-term application of singing bowl sound meditation. Accordingly, future mid- to long-term research targeting various age groups is recommended.

5. REFERENCES

1. Ma JY, Kim WS. Development and validation of the relaxation ability scale. Korean Journal of Meditation. 2021:11(2):39-57.
2. Kim WS, Sim KL. A Study on the Development and Validity of the Ajou Awareness Questionnaire. Korean Journal of Mediation. 2016;6(1):45-58.
3. Rayne RA, Donaghy M. Rayne's handbook of relaxation techniques: A practical guide for the health care professional. London: Churchil Livingstone, Elsevier. 2010. p.5
4. Son JR. Behavioral Relaxation Training and Behavioral Relaxation Assessment. Kor. J. Psychol.:Gen. 2011;30(4):973-993. UCI: G704-001037.2011.30.4.015
5. Kang YS. Mind-Body Approach the Area of preventive Medicine: Focusing on Relaxation and Meditation for Stress Management. Journal of preventive Medicine and Public Health. 2010;43(5):445-450. DOI:10.3961/Jpmph.2010.43.5.445.
6. Herbert Benson. MD & Willam Proctor. Beyond the Relaxation Response. Science meditation law. Seoul: academic governor. 2003.
7. An IS. A Study on the Characteristics of Singing Bowl's Sound. Asia-Journal of Multimeda Services Convergent with Art Humanities and Sociology. 2018;8(4):269-276. DOI: http://dx.doi.org/10.35873/ajmahs.2018.8.4.024.
8. Kim. GS. Buddha Bowl Meditation A Study on the Effect of Self-esteem Improvement Programs. -Focused on middle-aged women Buddhists- The Journal of the Korea Contents Association. 2021;21(2):676. DIO: http://dx.doi.org/10.5392/JKCA.2021.21.12.676.
9. Yu MR, Youn SI, Weon HW. The Effect of a Singing Bowl Loving-Kindness Meditation Program on Life Stress and EEG in Adults. Journal of the Korea Academia-Industrial cooperation Society. 2023;24(3):499-507. DOI: https://doi.org/10.5762/KAIS.2023.24.3.499.
10. Jun YK, Lee GL. The Impact of Singing Bowl Healing on the Autonomic Nervous System and Brainwaves. Sci. Emot. Sensib., 2023;26(4):125-132. DOI: http://doi.org/10.14695/KJSOS.2023.25.4.125.
11. Jang HG. Therapeutic Application og meditation to the Stress-Related Disorders. Korean Journal of health psychology. 2004;9(2):471-492.
12.. Lee TS, Kim MH, Kim JH, Kim JJ. The Effects of virtual Reality Program on Reducing Dental Anxiety. The Korean Journal of Health Psychology. 2017;22(2):257-269. DOI:10.17315/kjhp.2017.22.2.002.
13. Kim JM, Chang JY. The Effects of Meditation Music on a Psychological Stability and Aura. Journal of Character Education & Research. 2019;4(2):15-32. DOI:10.46227/JCER.4.2.2
14. Cho JY, Wang ZU, Hong YK. An EEG Study on the Interior Environmental Design Elements in Promoting Healing. Journal of the Korean Housing Association. 2023;34(3);3,067-3,079. DOI: http://doi.org/10.6107/JKHA.2023.34.3.067.
15. Lee SK, Shim JY. Effects of High School Students Listening to Music on EEG Activity Using Bran Wave Vibration Training. Journal of Brain Education. 2011: Sep;9(8):1-26. UCI:1410-ECN-0102-2014-300-002088197
16. Kim SJ. Human Physiology through pictures. Medical Books Pub., Seoul. 2012. p 20.
17. Lee SM, Kaufman A. Suh JK. Analysis of Pulse on Three Sensory Stimulations of Three Herbal Plants. J Korean Soc. People Plants Environ. 2012;13(4):241-247

18. Jeon GS, Kin YW, Lee JK. Effects of Abdominal Breathing Practice on Oxygen Saturation Insomnia Middle-aged Women. Journal of Naturopathy. 2022;11(2):116-122. DOI: http://doi.org/10.33562/JN.2022.11.2.6.