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Effects of Baduanjin Exercise on 160 Freshmen

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Abstract This study aimed to observe the physiological and psychological effects of Baduanjin on the college students. A total of 160 healthy freshmen were recruited and randomly divided into the control group and the test group. The subjects in the control group practiced "the 8th radio calisthenics, while those in the test group did Baduanjin, 5 times a week (30 min for each time), and 6 months practicing overall. Before and after the trial the physiological and psychological indexes were measured using Profile of Mood States (POMS) or Symptom check list-90(SCL-90) scale. The results showed that after exercise, lung capacity in test group was significantly improved (P<0.01), while heart rate was significantly decreased (P<0.05). Systolic pressure (SP) and diastolic pressure (DP) had no statistical difference before and after exercise. In the control group, cardiopulmonary functions had no statistical difference. The physiological indexes (weight, height, et al.) were no change in control and test group. Waist circumference in test group was significantly decreased (P<0.05), while waist circumference in control group had no change. (3) POMS scores (negative emotions, et al.) were significantly decreased (P<0.01) in test group and were significantly lower than that of control group (P<0.05 or P<0.01). Energy, and self-esteem scores were significantly increased in test group after exercise (P<0.01). The SCL-90 scores of test group were significantly lower on somatization, obsessive-compulsive, depression, anxiety and hostility (P<0.01 or P<0.05). The POMS and SCL-90 scores had no statistical difference before and after exercise in the control group. The study indicated that college students would get physiological and psychological benefit form practicing Baduanjin.

Keywords: *Baduanjin, radio calisthenics, freshmen, physiology, psychology*

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1. Introduction

Baduanjin, a branch of qigong, can date back to Song Dynasty. It is composed by 8 movements which are special for some viscera. According to Traditional Chinese Medicine, it can promote circulation of blood, dredging channels and collaterals. It is a kind of aerobic exercise, which is quite different from Western modern competitive sports. When practicing, people need focusing attention and staying calm. Baduanjin is an alternative treatment along with t'ai chi, yoga, and qigong. Studies have shown that Baduanjin is beneficial to lumbar disc herniation, knee osteoarthritis, diabetes, hypertension, hyperlipidemia and other disease. [1,5] Some studies showed that Baduanjin had positive effect on psychology and can strengthen physical fitness.

Psychological problem is a common phenomenon among college students. They may feel tension, anger, fatigue, depression, panic, etc. This is especially obvious among freshmen, because they are facing new learning and life environment.

The 8th radio calisthenics can be easily practiced without any athletics apparatus, so it is widely spread in middle school.

In order to test the psychological and physical functions which Baduanjin may achieve and to help freshmen quickly adapt to college life, a clinical trail was taken among freshmen in Yongzhou, China, compared with the 8th radio calisthenics.

2. Methods

2.1. Subjects and Grouping

A total of 160 freshmen from Hunan University of Science and Engineering were selected. Freshmen majoring in physical education and attending bodybuilding were not selected. They were randomly divided into two groups, the control group (exercising the 8th radio calisthenics) and the test group (exercising Baduanjin), according to the random number table with 80 freshmen in each group. In the control group, there were 41 females and 39 males aged from 17 to 19 years, averaged 18.6 years. While in the test group, there were 38 females and 42 males aged form 17 to 19 years, averaged 18.7 years. There was no significant difference between the two groups in gender, age and other index parameters including lung capacity, chest circumference, weight, heart rate, blood pressure, height, POMS and SCL-90 scores

2.2. Baduanjin Intervention

The trial was carried out 5 times a week (30 min for each time) for 6 month at the playground. The exercises

were proceeding following the tape commands of Baduanjin or the 8th radio calisthenics. During the trial, the participants were asked not to attend any other high strength playing except attending physical education course in the duration of the six month study. Date was collected before and after the trial.

2.3. Observation Indicators and Methods

Indicators of the participants such as lung capacity, chest circumference, weight, heart rate, systolic pressure (SP), diastolic pressure (DP) and height were examined by two different researchers, who didn't see the other's measurement results before and during the measurement process. Their average was taken as the measurement results. Chest circumference reading was read at the end of expiration and in the beginning of inspiration. Psychological indexes (somatization, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, horror, paranoid ideation, psychopathy, tension, anger, fatigue, energy, panic and self-esteem) were achieved by using POMS and SCL-90 scale.

2.4. Statistic Analysis

All date were expressed as mean±standard deviation ($\bar{x} \pm s$), and the statistical analysis was performed with SPSS16.0. Comparisons were performed with paired t-test. *P*-Values less than 0.05 were considered as statistical significance.

3. Results

3.1. Effect of Baduajin on Cardiac and Pulmonary Functions

The lung capacity had no statistical difference before and after exercise in the control group. After six month exercise, lung capacity in test group was significantly improved ($P< 0.01$), while the heart rate was significantly decreased ($P<0.05$). Systolic pressure and diastolic pressure had no statistical difference before and after exercise in the control group and the test group. After exercise these were statistical difference in lung capacity and heart rat between the control group and test group ($P<0.01$). Lung capacity in the test group was larger than that of control group, while the heart rate was slower (Table 1).

3.2. Effect of Baduajin on Figure Index

The weight, height and chest circumference had no statistical difference before and after the exercise in both control and test group. After six month exercise, Waist circumference in test group was significantly decreased ($P<0.05$). After exercise waist circumference had statistical difference between the control group and test group ($P< 0.05$). Waist circumference in the test group was lesser than that of control group (Table 2).

Table 1. Effects of the Baduanjin on the cardiopulmonary functions ($\bar{x} \pm s$)

Indicators	Group	Male exercise		Female exercise	
		Before	After	Before	After
Lung capacity (ml)	Control	3478.5±450.1	3489.8±439.5	2623.5±339.4	2642.7±354.2
	Test	3498.3±443.2	3913.4±449.8[1)2)]	2601.1±347.8	2864.7±357.2[12)]
Heart rate (beat/min)	Control	71.4±4.9	70.8±5.1	78.6±4.1	78.0±5.5
	Test	71.1±5.3	68.6±4.7[3)]	79.2±4.2	77.0±5.1[3)]
SP (mm Hg)	Control	114.1±5.2	113.4±4.9	111.3±4.4	110.8±6.3
	Test	113.8±5.4	112.9±4.3	110.9±5.1	109.6±3.7
DP (mm Hg)	Control	72.1±3.5	71.8±3.6	67.1±5.5	66.5±4.8
	Test	71.6±3.1	71.0±3.4	66.8±5.8	65.2±4.6

1) $P < 0.01$, 3) $P < 0.05$(before and after exercise); 2) $P <0.01$ *vs* control group.

Table 2. Effects of the Baduanjin on the figure index ($\bar{x} \pm s$)

Indicators	Group	Male exercise		Female exercise	
		Before	After	Before	After
Weight (Kg)	Control	56.1±5.4	55.3±3.1	52.4±3.9	51.5±3.8
	Test	55.4±4.7	54.8±3.9	51.1±3.4	50.7±3.2
Height (cm)	Control	168.5±3.9	168.7±3.7	157.1±3.6	157.2±3.9
	Test	168.3±3.6	168.5±3.4	155.6±4.7	155.7±4.8
Chest circumference (cm)	Control	86.7±3.7	87.1±4.0	80.1±4.4	80.9±4.6
	Test	86.1±4.5	86.5±4.1	80.7±5.1	81.1±4.8
Waist circumference (cm)	Control	76.6±5.0	76.2±4.8	69.7±5.2	69.3±5.1
	Test	76.1±4.3	74.0±4.6[1)2)]	69.1±4.1	67.0±4.9[1)2)]

1) $P < 0.05$(before and after exercise); 2) $P <0.01$ *vs* control group.

3.3. Effect of Baduajin on the Thickness of Subcutaneous fat

The thickness of subcutaneous fat at inferior angle of scapula, triceps brachii and abdomen had no statistical difference before and after the exercise. And there was also no statistical difference between the control and test group in male or female (Table 3).

3.4. Effect of Baduajin on the POMS and SCL-90 Scores

The POMS scores had no statistical difference before exercise between the control group and test group. After exercise negative emotions (tension, anger, fatigue, depression and panic) scores were significantly decreased, and the energy, and self-esteem scores were significantly increased in test group (P<0.01). After exercise the negative emotions, tension, anger, fatigue, depression and panic scores in test group were significantly lower than that of control group (P< 0.05 or P< 0.01), while energy, and self-esteem scores were significantly higher than that of control group. After exercise the SCL-90 scores of test group were significantly lower on somatization, obsessive-compulsive, depression, anxiety and hostility (P< 0.01 or P< 0.05). The results showed that Baduanjin can inhibit negative emotions and improve positive emotions, while the 8th radio calisthenics had no these functions (Table 4).

4. Discussion

In the trial, improvements in physical and psychological functions were observed in Baduanjin group. The result showed that Baduanjin could improve the figure, increase lung capacity, and cultivate positive emotions. After the exercise waist circumference in Baduanjin group was significantly decreased.

Table 3. Effects of Baduanjin on the thickness of subcutaneous fat ($\bar{x} \pm s$)

position	Group	Male exercise		Female exercise	
		Before	After	Before	After
inferior angle of scapula (mm)	Control	11.68±0.98	11.59±0.83	13.44±0.67	13.27±0.82
	Test	11.75±1.04	11.64±0.91	13.56±0.42	13.33±0.75
triceps brachii	Control	9.51±1.13	9.47±1.22	12.59±1.54	12.48±1.41
	Test	9.54±1.08	9.49±1.23	12.55±1.01	12.30±1.17
abdomen	Control	13.60±1.46	13.45±1.38	14.61±0.85	14.54±0.59
	Test	13.54±1.36	13.50±1.51	14.59±0.78	14.47±0.63

Table 4. Effects of Baduanjin on the POMS and SCL-90 scores ($\bar{x} \pm s$)

Indicators	Group	SCL-90		Indicators	Group	POMS	
		Before	After			Before	After
somatization	Control	1.63±0.45	1.59±0.49	tension	Control	3.12±2.51	2.62±1.12
	Test	1.60±0.53	1.43±0.47[1)4)]		Test	3.24±2.16	1.23±0.56[2)3)]
obsessive-compulsive	Control	2.42±0.59	2.31±0.39	anger	Control	3.35±2.64	2.77±1.51
	Test	2.38±0.60	1.52±0.47[2)3)]		Test	3.41±2.57	0.97±0.12[2)3)]
interpersonal sensitivity	Control	1.90±0.34	1.81±0.56	fatigue	Control	2.91±2.76	2.87±2.64
	Test	1.83±0.47	1.73±0.38		Test	2.89±2.84	0.45±0.13[2)3)]
depression	Control	1.90±0.41	1.86±0.37	depression	Control	2.06±1.85	1.89±1.17
	Test	1.83±0.35	1.65±0.42[2)3)]		Test	2.15±1.77	0.14±0.04[2)3)]
anxiety	Control	1.71±0.44	1.68±0.48	energy	Control	9.67±4.3	10.41±2.84
	Test	1.67±0.59	1.40±0.53[2)3)]		Test	9.85±4.65	15.54±3.45[2)3)]
hostility	Control	1.60±0.68	1.57±0.55	panic	Control	2.81±2.31	2.57±1.19
	Test	1.56±0.64	1.24±0.57[2)3)]		Test	2.96±2.40	2.21±0.74[1)3)]
horror	Control	1.50±0.49	1.56±0.56	self-esteem	Control	7.05±3.24	7.54±2.06
	Test	1.47±0.41	1.54±0.38		Test	7.20±3.56	10.68±2.68[2)3)]
paranoid ideation	Control	1.74±0.64	1.71±0.54				
	Test	1.70±0.51	1.67±0.48				
psychopathy	Control	1.50±0.37	1.47±0.59				
	Test	1.43±0.34	1.48±0.46				

1) P < 0.05, 2) P <0.01 *vs* control group; 3) P < 0.01, 4) P < 0.05 (before and after exercise).

The 8th radio calisthenics are composed by 8 segments including stretch, chest-stretching, lifting leg, body side, body rotation, all-round, jumping, and reorganization exercise. It has been spread and practiced in primary and secondary school in China, and has taken an important role in improving the student's corporeity.

But the study showed the 8th radio calisthenics had no effects on freshmen's somatotypes, cardio-pulmonary function and psychological state. Some studies showed that college student's psychological and physical quality were not as good enough as expected. For example, college student's physical condition can not fit the need of study. Some students feel sleepy during the class; they have great pressure and don't know how to face the pressure. The possible reasons are that the energy expenditure is limited and that there is no consciousness training in the practicing.

The purpose of exercise is to keep people healthy. The World Health Organization definition of health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. So we can say baduanjin can make people feel healthier.

Baduanjin requires a continuous and large scaled move of the body and the limbs. For example, The first part (combing triple energizer with two hand over the head, 两手托天理三焦) and the second part (one hand push and another pull liking a bow, 左右开弓似射雕) can expand the thorax and promote the movement of diaphragm as far as possible, unlike the 8th radio calisthenics has smaller scale movement. This may help to improve lung capacity. Different from 8th radio calisthenics, the rhythm of Baduanjin is lower, so it may help to calm and relax the mind.

Exercise intensity of Baduanjin is not fierce, and its requirements for ground and athletics apparatus are not high, so it is easy to exercise for college student. It was worthy of popularizing in college.

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