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Original Article

Aerobic exercise combined with long-term drinking of lotus-leaf water can produce better effect on weight reduction

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Abstract: Purpose: To observe the effect of aerobic exercise combined with drinking of Lotus-leaf water on the body fat rate and blood lipid parameter of the patients with high body fat. Method: select 80 young and middle-aged patients with high body fat and divide them into an Observation Group and a Control Group by random number table, with each group consisting 40 patients. The Control Group have aerobic exercise and just drink purified water or cooled boiled water; while the Observation Group will take tea made with lotus leaf ash after doing aerobic exercise. Test the body fat rate, blood lipid, hemorheology and life satisfaction of the two groups of patients before and 12 weeks after the treatment. Result: after treatment for 12 weeks, the body fat rate of the control group has been evidently improved ($^aP<0.05$), while the improvement in parameters in blood lipid and hemorheology of most of the group is not obvious ($P>0.05$); Compared with the Control Group, both the body fat rate and the parameters in blood lipid and hemorheology of the Observation Group have been evidently improved, $^aP<0.05$ and $^bP<0.05$ respectively, which means that the effect of treatment of the Observation Group is obvious better than that of the Control Group. In terms of their appetites, the appetites of 55% of the Control Group are improved and only 15% of the group deteriorate in this aspect, while the rate of the members in the Observation Group whose appetites decrease reaches as high as 47.5% and only 20% of this group show a sign of improvement in their appetite. This means that, the appetites of the Observation Groups are obviously reduced. Conclusion: aerobic exercise combined with drinking of Lotus-leaf water can produce better effect than mere aerobic exercise and long-term drinking of water made with lotus leaf ash can at once reduce appetite and reduce weight more effectively.

Keywords: Aerobic exercise, lotus-leaf water, combination, high body fat, effect of treatment

Introduction

Body fat rate is the ratio between the body fate and the body weight. Compared with BMI (KG/m^2), body fat rate can more accurately reflect the proportion of fat content [1, 2]. That is, an overweight person may not necessarily a patient with high body fat, but a person with normal weight may be such a patient. Obesity is the pathogenic factor to many diseases and the root the high fat content. Body fat rate is an effective parameter to indicate whether the body fat content exceeds the relevant standard. High fat content, especially the hyperlipemia caused by it, seriously affects the physical health of human beings [3, 4]. Currently, the number of hyperlipemia patients with obesity as the main characteristic is increasing progressively in China and more and more people who pay attention to their health begin to realize the side effect of obesity. So, some weight-reduction measures like aerobic exercise, drug therapy and diet are becoming an increasing concern of the people wishing to lose weight [5, 6]. This study, taking patent with high body fat as its objects, gives practical treatment to the patients by combining aerobic exercise with drinking of lotus-leaf water to observe the effect of improvement of the body fat rate, blood lipid and hemorheology, and the combined method proves effective.

Data and method

Objects of study

In order for the selection of the objects of study and the late-stage practical treatment so as to

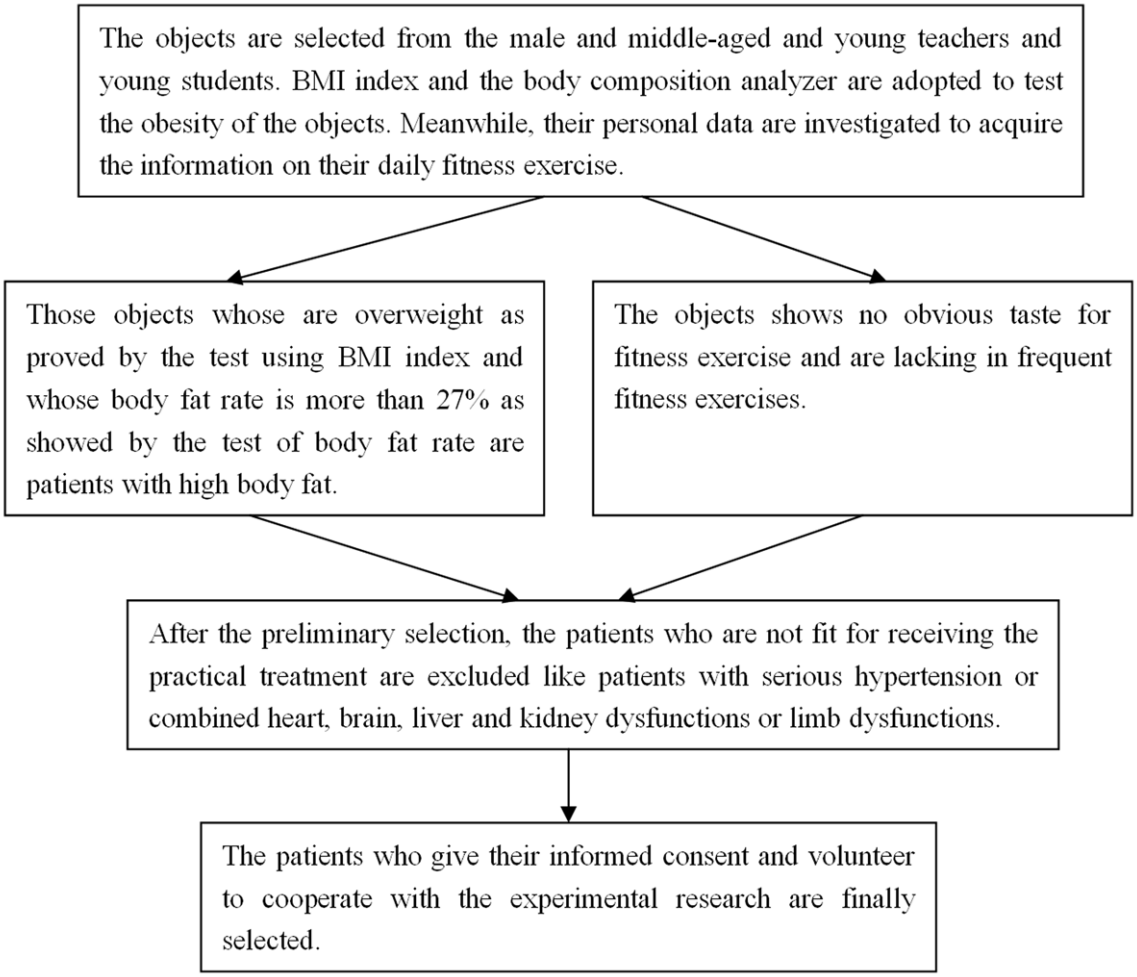

Figure 1. Flow chart for case selections.

reflect the controllability and convenience of the practical treatment, the objects of this study were chosen from the young and middle-age faculty and the young students. A total number of 80 patients with high body fat were selected who were between 21 and 40 years old (**Figure 1**). The standard for the selection was as follows: the BMI (Body Mass Index) testing showed that they were overweight, had no hobby for fitness and frequent physical exercise. The body fat rate of the selected male patients >27%, which meant that they were patient with high body fat; furthermore, all patients knew and volunteered to cooperate with the practical treatment. The patients with severe hypertension or serious problems with their hearts, brains, livers or kidney or limp functions were excluded. The 80 patients were divided into a Control Group and an Observation Group according to the random table number, with each consisting of 40 patients. See **Table 1** for the basis data of the two groups of patients. The statistical consistency comparison showed that the difference had no statistical significance and comparability, $P>0.05$.

Treatment method

The Control Group were treated with aerobic exercise, during which purified water or cooled boiled water was given to them to supplement the water they lost. Training process and method: the patients did aerobic exercise every Monday, Wednesday and Friday; and did aerobic endurance running every Tuesday, Thursday and Saturday, six trainings a week in total, with each training done with low and moderate intensity (heart rate 110/minute or so) and last-

Table 1. Basic data comparison between the two groups before the treatment ($\bar{x}\pm s$)

Group	Male (number)	Age (years old)	Height (cm)	Weight (kg)	Body Fat Rate (%)
Control group	40	32.50±5.71	172.36±4.81	81.42±6.20	28.85±2.54
Observation group	40	33.19±5.54	172.05±4.70	81.26±6.23	28.92±2.61

Note: $P>0.05$.

Table 2. Comparison of BMI Indexes and body fat rates of the two groups before and after the treatment ($\bar{x}\pm s$)

Group	Male (number)	BMI indexes (kg/m^2)		Body fat rate (%)	
		Before treatment	After treatment	Before treatment	After treatment
Control group	40	27.41±2.26	25.10±2.04[a]	28.85±2.54	25.43±2.17[a]
Observation group	40	27.45±2.29	24.92±2.07[a]	28.92±2.61	23.74±2.10[a,b]

Note: Comparison in each Group after and before the treatment, [a]$P<0.05$; Effects of improvement between the two groups at the same point of time after the treatment, [b]$P<0.05$.

ing for about 60 minutes. The training last for 12 weeks in total, during which time, the patients just took purified or cooled boiled water. The Observation Group took the same aerobic training in the same manner, with the same intensity and for the same time, but what they drank is lotus-leaf water during the training. The lotus-leaf water was made as follows: 15 grams of lotus leaf ash was placed into the hot water at 80-90 degree to make 1000 ml tea, which was taken by the patients for 250 ml two hours before each meal, with another 250 ml taken after the aerobic exercise for that day. If there was no such training that day, the patients would take about 300 ml each time. In addition, the two groups may drink purified or cooled boiled water without limit so as to supplement the water they need. Meanwhile, they were banned from drinking any beverage like beer, cola or tea.

Evaluation of therapeutic effects

Before and 12 weeks after the treatment, the two groups of patients were tested in terms of their body fat rate, blood lipid and hemorheology. ① The body fat rate was tested with the (Omron) HBF-370 body fat measurement instruments produced by Krell Precision Co., Ltd; ② Before the treatment, their venous blood was tested. Before the venous blood testing 12 weeks after the treatment, the patients stopped their training and other supporting treatment 2 days in advance and tool no high-fat food the day before the testing. Then, their blood sample was taken while their stomachs were empty the next day. The index for the blood testing included TG, LDL-C, HDL-C and TC which reflected condition of the blood lipid of the patients. ③ The LBY-N6C Hemorheology tester produced by Beijing Precil Instrument Co., Ltd was used to test such indexes as whole blood viscosity, plasma viscosity, HCT and ESR; ④ After the treatment for 12 weeks, a total of 80 Q & As were distributed to the objects of this study and all of them (100%) were taken back. The investigation covers three questions of appetite, sleep and mental feelings and there are three options for each question: improved, worsened or unchanged. Before the questionnaires are distributed to the people to be investigated, the purpose of the questionnaires are introduced and they are required to truthfully write down the changes in their feelings, the said options for such changes and the comparison between their feelings prior to the treatment and those after the 12-week treatment.

Statistical analysis

The statistical software of SPSS 19.0 version was adopted to compare the body fat rate and blood lipid of the two groups of patients before and after the treatment. In each group, the relevant indexes were compared before and after the treatment; while the effects of improvement were compared between the two groups after the treatment. The data was demonstrated with ($\bar{x}\pm s$), and t-testing and X^2 testing were adopted to compare measurement data and enumeration data respectively. $P<0.05$ meant that there was statistical significance.

Table 3. Comparison of blood lipid Indexes of the two groups before and after the treatment ($\bar{x}\pm s$)

Group	Male (number)	TG (mmol/L)		TC (mmol/L)	
		Before Treatment	After Treatment	Before Treatment	After Treatment
Control group	40	3.40±0.36	2.77±0.32[a]	5.81±0.45	4.96±0.39[a]
Observation group	40	3.39±0.34	2.32±0.29[a,b]	5.83±0.46	4.11±0.37[a,b]
		HDL-C (mmol/L)		LDL-C (mmol/L)	
		Before Treatment	After Treatment	Before Treatment	After Treatment
		1.15±0.13	1.24±0.14	2.98±0.27	2.78±0.25
		1.15±0.12	1.43±0.16[a,b]	2.97±0.26	2.49±0.23[a,b]

Note: Comparison in each Group after and before the treatment, [a]$P<0.05$; Effects of improvement between the two groups at the same point of time after the treatment, [b]$P<0.05$.

Table 4. Comparison of hemorrheology parameters of the two groups before and after the treatment ($\bar{x}\pm s$)

Group	Male (number)	Whole blood high shear viscosity (mpa.s)		Whole blood low shear viscosity (mpa.s)	
		Before treatment	After treatment	Before treatment	After treatment
Control group	40	5.45±0.56	5.12±0.50[a]	9.33±0.94	8.69±0.89[a]
Observation group	40	5.46±0.57	4.81±0.49[a,b]	9.34±0.97	8.40±0.90[a,b]
Plasma viscosity (mpa.s)		HCT (%)		ESR index (mm/L)	
Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
1.90±0.16	1.78±0.14[a]	0.51±0.06	0.48±0.04	18.50±6.11	17.82±5.99
1.91±0.15	1.69±0.11[a,b]	0.52±0.06	0.42±0.02[a,b]	18.49±6.09	15.24±5.62[a,b]

Note: Comparison in each Group after and before the treatment, [a]$P<0.05$; Effects of improvement between the two groups at the same point of time after the treatment, [b]$P<0.05$.

Result

After the treatment, the BMI index and the body fat rate of the two groups are improved but to a different extent

Table 2 showed that, after the treatment for 12 weeks, the BMI indexes and body fat rates of the two groups were evidently improved, [a]$P<0.05$ for both of the two groups; while the comparison between the effects of improvement after the treatment showed that the effect of improvement in the body fat rate of the Observation Group was better than that of the Control Group, [b]$P<0.05$, and the difference between the two effects had statistical significance. Please be noted that the Observation Group lost much more weight than the Control Group.

Comparison of blood lipid parameters before and after the treatment

Table 3 showed that, after the treatment for 12 weeks, TC and TG of the Control Group were evidently improved ([a]$P<0.05$) and other indexes just showed the tendency for improvement, but the actual overall improvement in blood lipid was unapparent. While the blood lipid indexes were evidently improved after the treatment ([a]$P<0.05$ for all of them) and the effects of improvement in most of the indexes were much better than those of the Control Group ([b]$P<0.05$). Please be noted that the treatment method for the Observation Group was more effective to improve the blood lipid indexes.

Comparison of hemorheology parameters before and after the treatment

Table 4 showed that, after the treatment for 12 weeks, the blood viscosity was evidently improved ([a]$P<0.05$), but there was no apparent improvement in the indexes for HCT and ESR. While the hemorrheology parameters of the Observation Groups were evidently improved than its own parameters before the treatment ([a]$P<0.05$) and those of the Control Group after the treatment ([b]$P<0.05$). Please be noted that the treatment method for the Observation

Table 5. Comparison of satisfaction with diet, sleep and mental feelings before and after the treatment (male, n=40)

Group	Appetite (n, %)			Sleep (n, %)			Mental Feelings (n, %)		
	Better	Worse	Intact	Better	Worse	Intact	Better	Worse	Intact
Control group	22, 55.0	6, 15.0	12, 30.0	19, 47.5	5, 12.5	16, 40.0	16, 40.0	5, 12.5	19, 47.5
Observation group	8, 20.0[a]	19, 47.5[b]	13, 32.5	21, 52.5	4, 10.0	15, 37.5	14, 35.0	5, 12.5	21, 52.5

Note: After the treatment, Comparison between the two groups in terms of appetite difference, [a]$P<0.05$ and [b]$P<0.05$; Comparison in terms of difference in sleep and mental feelings, $P>0.05$.

Group was more effective to improve the hemorrheology parameters.

Comparison of life satisfaction before and after the treatment

Table 5 suggests that, after the treatment for 12 weeks, the sleep quality an mental feelings of the two groups show a tendency of improvement, however, the effect of such improvement between the two groups is not so distinct; while the appetites of the two groups differ significantly. The data show that, the appetites of 55% of the Control Group are improved and only 15% of the group deteriorate in this aspect, while the rate of the members in the Observation Group whose appetites decrease reaches as high as 47.5% and only 20% of this group show a sign of improvement in their appetite. So, it can be seen that the appetites of the Observation Group become worse while those of the Control Group are obviously improved. It is suggested that, as the Observation Group take drinks made of lotus leaf ashes for a long time, their appetites are suppressed and they tend to eat less.

Discussion

In recent years, with the increase of the people's living standard and motion inert, the number of overweight people and the obesity rate are also increased. Obesity has become an important factor which affects the physical health of the Chinese people and especially healthy development of the adolescents. From the perspective of the somatotype of the overweight and obese people, most of them have developed abdominal obesity with high body fat rate, which results from over-nutrition and lack of physical labor or keep-fit exercise [7-9]. Body fat rate is an index that reflects the fat content. Compared with BMI, its reflection of fat content is more accurate. Some study points out that, although the athletes who do long-term physical exercise (e.g, the boxer and the weightlifters) are overweight (i.e, their BMI is high), their body fat rate is rather low. So, scientific and reasonable keep-fit exercise can obviously increase the content of muscle, without increasing the body fat [10, 11]. That means, body fat rate can more accurately and objectively reflect the fat content, in the meantime, it can, from the perspective of keep-fit exercise, reflect the accumulated energy taken by the body and the physical exercise done by the people. This article studied the young and middle-age patients with high body fat who seldom do physical exercises. After the 12-week aerobic training for the 40 patients in the Control Group, their body fat rates were evidently improved, which is consistent with the relevant theory and report on weight reduction through aerobic exercise; but the improvement in the parameters for their blood lipid and hemorrheology was unapparent, the reason might be that the 12-weeking training was not long enough, or the load given to them during the training was insufficient.

Lotus leaf as, also called calcined lotus leaf, is a traditional Chinese medicine, tasting bitter and a little salty. It is pungent-cool and conducive to remove summer-heat and dampness, increase warmth and expel pathogen, dispel stasis and stanch bleeding, facilitate diuresis and feces excretion, and help digestion and fat burning [12, 14]. Its history of weight reduction can be traced back to the Ming Dynasty. In recent years, it also attracts the attention of the obese patients and the scientific researchers. Some reports point out that, the total alkaloids and nuciferine of the lotus leaf can obviously suppress the proliferation of 3T3-L1 Pre-adipocytes and such suppression may be strengthened with the increase and time extension of the total alkaloids and nuciferine, which will in turn restrict the proliferation of 3T3-L1

Pre-adipocytes [15, 16]. The researcher, Tu Changchun [17], used the total alkaloids of the lotus leaf to interfere with the obese rats with hyperlipemia. After 3-week interference, it was found that such indexes as TC, TG and atherosclerosis of the rats were obviously reduced and the increase of their weight was evidently suppressed as well. The researcher, Guang Zhangshun [18] used the aqueous extracts of lotus to conduct clinical study of the patients with hyperlipemia and found that, after the treatment, the indexes like TC, TG, LDL-C and HDL-C of the patients were evidently improved. In this study, the patients in the Observation Group used lotus leaf water to replace other beverages during their aerobic exercise. After the treatment for 12 weeks, their various indexes were much better than those of their own before the treatment and those of the Control Group after the treatment. In particular, the improvement in their blood lipid and hemorheology was even more apparent, which might be due to the function of the lotus leaf water for fat burning, weight reduction and blood lipid improvement; furthermore, as for the results of the questionnaires for life satisfaction, there was no apparent difference between the two groups in terms of the quality of their sleep and mental feelings. But the changes in the appetites of the two groups proved very different in that, the appetite of the Control Group was improved, while the appetite of the Observation Group became worse. So, this study suggests that long-term drinking of lotus leaf water can suppress the appetite and reduces the intake of food, which in turn contributes a lot to weight reduction.

In summary, the result of this study suggests that, during the treatment of aerobic exercise for patients with high body fat, lotus-leaf water in substitution for other daily beverage and as supporting method is more conducive to improve the indexes of the patients for body fat rate, blood lipid and hemorheology, meanwhile, it can reduce the appetite and food intake of the people wishing to lose weight, therefore, it can greatly enhance the effect of aerobic exercise. In addition, as lotus leaf water is easy to make in daily life, it can be used to replace other beverages to supplement water for the patients during their training. Moreover, it produces no poisonous or side effect, so, it is worthy of clinical practical and popularization.

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Disclosure of conflict of interest

None.

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