

## Original Article

# EMP acupoint stimulation conducive to increase the effect of weight reduction through aerobic exercise

Chun Jiao<sup>1</sup>, Ximei Zhu<sup>2</sup>, Hongyu Zhang<sup>2</sup>, Xiaowei Du<sup>1</sup>

<sup>1</sup>The Lab of Human Body Science, Henan Polytechnic University, Jiaozuo 454000, Henan Province, China; <sup>2</sup>The Center of Physical Health, Henan Polytechnic University, Jiaozuo 454000, Henan Province, China

Received March 15, 2015; Accepted June 30, 2015; Epub July 15, 2015; Published July 30, 2015

**Abstract:** Purpose: to observe whether weight reduction through aerobic exercise is more effective with the intervention of electromagnetic pulse (EMP) Acupoint stimulation. Method: based on the need of this study, we choose 48 young and middle-aged obese patients and randomly divide them into Experimental Group and Control Group with each group consisting of 24 of them. The Control Group has an aerobic endurance running each day with each running lasting for about 45 minutes and covering about 6 KM; the Experimental Group has the same exercise as the CG, but, after their running, stimulation by electromagnetic pulse meter is given to their Sanyinjiao Acupoint and Zushanli Acupoint. Then the content of body fat and the lipid indexes of the two groups before the treatment are compared with their counterparts after the said treatment. Result: after 6 weeks of treatment, the various indexes of the two groups are improved to different degrees ( $P<0.05$ ); the effect on lipid indexes of the Experimental Group is obviously better than that of the Control Group ( $P<0.05$ ), but the content of their body fat shows no conspicuous difference ( $P>0.05$ ). Conclusion: after 6 weeks of treatment, the intervention of EMP acupoint stimulation can more evidently improve the lipid indexes than it has done to the group only having aerobic exercise; but it has little effect in terms of the improvement of the body fat content, which may be because of the short time of such intervention.

**Keywords:** Aerobic exercise, electromagnetic pulse, acupoint stimulation, obesity, treatment effect

## Introduction

In recent years, with the increase of the people's living standard and motion indolence, the number of the obese people increase as well due to the accumulation of excessive fat in their body. Obesity is a bane of many diseases, in particular, it causes malfunction of metabolism, dyskinesia and hyperlipidemia, whereby bringing out many inconveniences to the daily life the patients and seriously affecting their physical and mental health [1-3]. At present, aerobic exercise is liked and taken by the patients to prevent and treat obesity and hyperlipidemia. For example, jogging, fast walking and aerobic gymnastics exercise are well-recognized treatment method through aerobic exercise. This method requires the patients to continual the ongoing exercises and consume at least 300 kilocalorie in each exercise to achieve the desirable effect [4-6]. The researchers have paid attention to the effect of weight

reduction by massaging or stimulating the Acupoint, for example, EMP weight reduction instrument has gradually appeared in the market of health care devices. This study, on the basis of normal aerobic exercise, use EMP Acupoint stimulation as an assisting measure to treat the young and middle-aged obese patients to explore the effect of intervention of EMP acupoint stimulation on the content of body fat and the relevant lipid indexes of the patients.

## Data and methods

### Experiment materials

For purpose of the convenience of the experiment and mitigation of the effect of the job nature, diet structure, food intake, age and gender on the outcome of the research, the experimental subjects are chosen from the young and middle aged teachers and students of Henan Polytechnic University (HPU). All the experimen-

## Acupoint stimulation conducive to weight reduction

tal subjects are aware of and will to accept the experiment. Firstly, the physical health files of the teacher and students are retrieved from the Physical Health Center of HPU to acquire the first-hand information of the patients. There are 48 male young and middle-aged patients with simple obesity at the age ranging from 25 to 45. All of them are prohibited from overeating during the experiment. Their three meals a day are managed by the life teacher at the staff canteen of HPU, they may drink water freely but cannot take any other food. The references and requirements are as follows: the classification standard for overweight and obese patients formulated by data summery, analysis and coordination team of WGOC; Body Mass Index (BMI)= Body weight (KG)/height (m<sup>2</sup>). BMI=18.5~23.9 means normal weight; BMI=24~27.9 means slight obesity, i.e, overweight; and BMI>28 means obesity. All experimental subjects meet the diagnosis standard for obesity: all of their BMI>28 and they have no respiratory diseases, serious cardia-cerebrovascular diseases, kidney diseases or dyskinesia. The patients are divided into Experimental Group and Control Group by adopting the random number table with each group consisting of 24 patients. See **Table 1** for the general data of the two groups of patients, the statistical analysis shows that the difference has no statistical significance but have comparability.

### *Therapeutic method*

During the period from September, 2012 to November 2012, the six-week experiment and study was conducted of the 48 experimental subjects at the Physical Health Center of HPU and the specific therapeutic method is as follows: ① as for the CG, the group just take continual aerobic endurance running for one time per day and run slowly around the 400-meter track for 15 rounds (6 KM) for about 45 minutes; ② as for the EG, after they take the same exercise as the CG, they will be treated by EMP Acupoint stimulation for 30 minutes. The ZP-5-type Kangbo computer pulse instrument (produced by Zhengzhou Zhongkang Health Industry Development Co. Ltd) and AV220V, 50 HZ/DC12V power are used. In the treatment, the 4 pulse wave patches of the instrument are respectively used on the Sanyinjiao Acupoint and the Zushanli Acupoint (See **Figure 1**) and the strength of the instrument is adjusted

based upon the sensitivity of the patients. The general strength is about 400-600 mT and the pulse frequency is 40-60 time/minute.

### *Effect evaluation*

The percentage of body fat and lip indexes of the two groups of patients before the treatment and those after the treatment are inspected. Their percentage of lipid is directly detected by the JS70G65 type Body Composition Analyzer (produced by Midwest Group). The two groups stop any exercise or treatment 2 days before the lipid detection and void any pyper lipid diet on the day preceding the detection and their venous blood is extracted for inspection the next day. The lipid indexes detected are those which can reflect the hyperlipaemia of the patients, including (Triglyceride, TG), (Low density lipoprotein cholesterol, LDL-C) and (High density lipoprotein cholesterol, HDL-C).

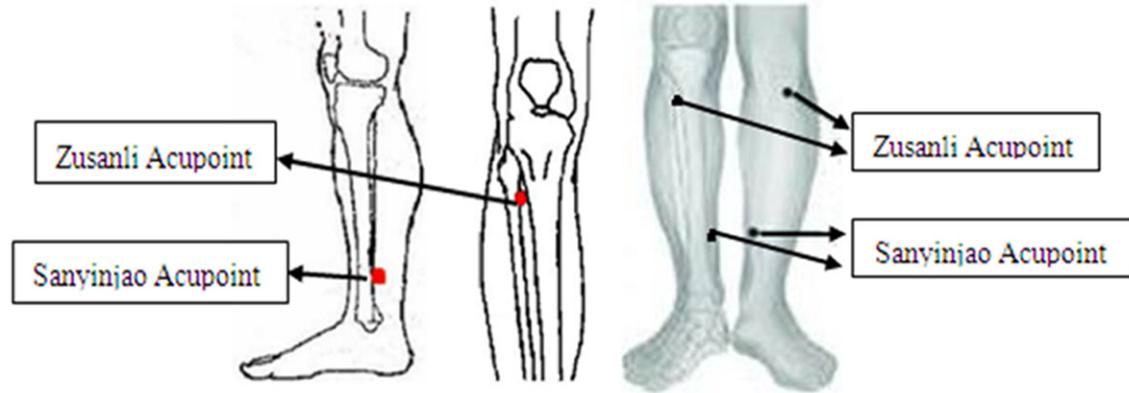
### *Statistical analysis*

The data derived from the detection is expressed with ( $\bar{x} \pm s$ ) and processed with SPSS 13.0. Use t inspection for comparison of measurement treatment and  $P < 0.05$  demonstrates the statistical significance of the difference.

### **Result**

As for the general data of the two groups of patients at the time when they are selected, the difference between the inter-group indexes ( $P > 0.05$ ) has no statistical significance (see **Tables 1** and **2**) and the intervention of the result of the experiment from such quantitative factors as the gender, job nature, food intake and diet structures of the patients has been excluded when the subjects are selected and the experiment is carried out to ensure the reliability of the experimental data. After six weeks of treatment, the change of percentage of body fat and the lipid index before and after the treatment can be seen in **Table 2**: the various indexes of the two groups are improved obviously (<sup>a</sup> $P < 0.05$  and <sup>b</sup> $P < 0.05$ ). A comparison between the Experimental Group and the Control Group shows that the improvement of the lipid index of the former is more obvious (compare the two group after the treatment in terms of TG, HDL-C and LDL-C, the values of T are 2.516, 3.172 and 2.082 respectively,  $P < 0.05$ ) and the difference has statistical sig-

## Acupoint stimulation conducive to weight reduction



**Figure 1.** “Sanyinjiao acupoint” refers to that Qi-blood materials of three Yin channels in the foot (That is, “spleen” channel, “kidney” channel and “liver” channel) intersect in it, thus it is called “Sanyinjiao acupoint”. “Zusanli acupoint” is one of the main acupoints in stomach channel. In traditional Chinese medicine, it believes that by stimulating or massage of the two acupoints, it can regulate spleen and stomach, harmonize Qi-blood, clear and activate the channels and collaterals, promote gastrointestinal motility and gastric emptying, facilitate the metabolism of the body and then promote the transportation and transformation function of the energy and material in the body so as to regulate the human body fat and blood lipid. Therefore, it is known as an important acupoint to help the body to lose weight and regulate blood lipids in the traditional Chinese medicine.

**Table 1.** Comparison of general data of the two groups of patients ( $\bar{x} \pm s$ )

Groups	Gender	Number	Age	Height (cm)	Weight (kg)	BMI (kg/m <sup>2</sup> )
Control Group	male	24	35.54±5.68	172.16±4.21	80.60±4.92	28.61±2.40
Experimental Group	male	24	34.79±5.26	171.53±4.60	81.24±4.51	28.54±2.37
<i>T</i>			0.445	0.714	0.912	0.381
<i>P</i>			0.723	0.526	0.329	0.815

Note:  $P > 0.05$ .

**Table 2.** Comparison between content of body fat and lipid indexes before and after the treatment of the two groups of patients ( $\bar{x} \pm s$ ,  $n=24$ )

Group	Percentage of Body fat (%)		TG (mmol/L)		HDL-C (mmol/L)		LDL-C (mmol/L)	
	BT	AT	BT	AT	BT	AT	BT	AT
Control Group	30.67±2.71	27.52±2.53 <sup>a</sup>	2.79±0.26	2.14±0.23 <sup>a</sup>	1.05±0.17	1.34±0.18 <sup>a</sup>	3.54±0.36	2.96±0.34 <sup>a</sup>
Experiment Group	31.05±2.48	26.31±2.41 <sup>b,c</sup>	2.81±0.25	1.81±0.22 <sup>b,e</sup>	1.04±0.21	1.59±0.20 <sup>b,e</sup>	3.51±0.35	2.74±0.32 <sup>b,e</sup>
<i>T</i>		1.015		2.516		3.172		2.082
<i>P</i>		0.137		0.031		0.016		0.042

Note: (BT= before Treatment AT= after Treatment) comparison of the Control Group after and before the treatment, <sup>a</sup> $P < 0.05$ ; comparison of the Experimental Group after and before the treatment, <sup>b</sup> $P < 0.05$ ; comparison between the Experimental Group and the Control Group after the treatment, <sup>c</sup> $P > 0.05$ ; comparison between the Experimental Group and the Control Group after the treatment, <sup>e</sup> $P < 0.05$ .

nificance; however, the two groups do not have much difference in terms of improvement of content of body fat (in the inter-group comparison in content of body fat after the treatment, the value of *T* is 1.015, and  $P > 0.05$ ) and the difference has no statistical significance.

### Discussion

From the definition of obesity, we can see that obesity is a certain degree of overweight and

over-thickness of fat deposit caused by accumulation of excessive fat, Triglyceride in particular. Of the many factors leading to obesity, the accumulation of excessive energy due to excessive intake of food energy and lack of effective exercise is a most contributing factor well recognized by the present society. The aerobic exercise like endurance running can not only reduce the volume of fat cells, but reduce the feeding efficiency and increase the metabolic rate by increasing the energy consumption,

## Acupoint stimulation conducive to weight reduction

whereby is able to reduce the fat accumulation to the greatest extent [7, 8]. The effect of aerobic exercise on weight reduction has been generally recognized by the society which can be better the aerobic endurance exercise lasts for more than 30 minutes, and the reasons will not be elaborated in this article. In this study, aerobic endurance exercise is given to the 48 obese patients one time each day for 6 weeks and each exercise last for about 45 minutes, and the result is consistent with the relevant researches: the content of body fat and the lipid indexes of the two groups of patients after the treatment, when compare with their counterparts before the treatment, show obvious improvement (<sup>a</sup> $P < 0.05$ ; <sup>b</sup> $P < 0.05$ ).

Weight reduction through Acupoint stimulation is based on the TCM meridian theory, according to which, obesity is most closely linked with the spleen. If people eat too much and exercise little, the spleen cannot convert the food and will lose its regulation function conducive to the body, then the body cannot normally absorb and exploit the nutrition, therefore, fat is accumulated and leads to obesity [9-11]. Modern medical research indicates that, stimulation on the corresponding Acupoints can effectively restrain the appetite to reduce food intake, restrict the absorption by the stomach and intestine to reduce the intake of energy, and promote the energy metabolism and the lipodieresis to achieve the ultimate goal of weight reduction [12-14]. EMP stimulation treatment means to adjust the electric current of the electrotherapy to create a pulse wave with such multiple functions of traditional physiotherapy as acupuncture, skinscraping, Fire cupping, massage and manipulation and use it to the humane body, or the lesion or the Acupoints to achieve the purpose of treatment. The relevant treatment principles show that, if EMP waves are directly working on the humane body, reactions will take place in certain tissues and cells and changes like ion shift, molecule vibration, membrane potential and permeability and PH values will be caused; meanwhile, angiectasis, or nervous excitation or neural inhibition will appear and blood circulation will speed up. All these are advantageous to metabolism [15, 16]. For example, the researches like Yu [17] point out that, EMP therapeutic instrument can, on the basis of acupuncture, reinforce the stimulation on corresponding Acupoints and

reorganize the fat cells by electrical stimulation, whereby accelerating lipodieresis; Weng [18] also proves that, low-frequency EMP stimulation on Acupoints can facilitate the improvement of blood circulation of relevant part of humane body which, in turn, accelerate metabolism and conduce to weight reduction. Sanyinjiao Acupoint and Zusanli Acupoint chosen in this study are both important Acupoints for weight reduction through massage and the stimulation and massage on them can coordinate the intestines and stomach, tonify middle-Jiao and Qi, clear and activate the channels and collaterals, promote gastrointestinal motility and gastric emptying, and conduce to metabolism [19-21].

The EG, after taking normal aerobic exercise, directly work the pulse patches on their Sanyinjiao Acupoint and Zusanli Acupoint to carry out EMP treatment. After 6 weeks of treatment, the content of their body fat and the lipid indexes are obviously improved (<sup>b</sup> $P < 0.05$ ), while a comparison between the EA and the Control Group shows that the effect on the lipid indexes of the EA is much better (<sup>c</sup> $P < 0.05$ ), but the effect on the content of body fat shows little difference (<sup>c</sup> $P > 0.05$ ). So, the reason why the combination treatment achieves better effect is that the said aerobic endurance exercise and EMP Acupoints stimulation can reduce fat and coordinate the humane body; furthermore, the EMP treatment on the Sanyinjiao Acupoint and Zusanli Acupoint after the normal aerobic exercise can relax the rear limb and the physical functions which is conducive to dispel fatigue and increase the efficiency of exercise. So, the result shows that, with intervention of EMP Acupoint stimulation, aerobic exercise can better increase the therapeutic effect on obese patients and the 6 weeks of treatment can obviously improve the lipid indexes. And the reason why it has little effect on improvement of body fat may be that the time for such intervention treatment is not long enough.

### Acknowledgements

Science and Technology Department of Henan Province, No. 112102310180.

### Disclosure of conflict of interest

None.

## Acupoint stimulation conducive to weight reduction

**Address correspondence to:** Dr. Ximei Zhu, Health Center of Physical Education Institute of Henan Polytechnic University, Shiji Road No. 2001, Jiaozuo 454000, Henan Province, China. Tel: +86-18236886388; E-mail: tzjk@hpu.edu.cn

### References

- [1] Rahmouni K. Obesity-associated hypertension: recent progress in deciphering the pathogenesis. *Hypertension* 2014; 64: 215-21.
- [2] Ma M, Song QH, Xu RM, Zhang QH, Shen GQ, Guo YH, Wang Y. Treatment effect of the method of Tai Chi exercise in combination with inhalation of air negative oxygen ions on hyperlipidemia. *Int J Clin Exp Med* 2014; 7: 2309-13.
- [3] Forhan M, Gill SV. Obesity, functional mobility and quality of life. *Best Pract Res Clin Endocrinol Metab* 2013; 27: 129-37.
- [4] Zhang W, Bai X, Ge H, Cui H, Wei Z, Han G. Meta-analysis in the association between obesity and risk of thyroid cancer. *Int J Clin Exp Med* 2014; 7: 5268-74.
- [5] Racil G, Ben Ounis O, Hammouda O, Kallel A, Zouhal H, Chamari K, Amri M. Effects of high vs. moderate exercise intensity during interval training on lipids and adiponectin levels in obese young females. *Eur J Appl Physiol* 2013; 113: 2531-40.
- [6] He F, Liu J. Prevalence of obesity among primary students from 2009 to 2014 in China: an update meta-analysis. *Int J Clin Exp Med* 2014; 7: 5348-52.
- [7] Salvadori A, Fanari P, Brunani A, Marzullo P, Codecasa F, Tovaglieri I, Cornacchia M, Palmulli P, Longhini E. Leptin level lowers in proportion to the amount of aerobic work after four weeks of training in obesity. *Horm Metab Res* 2015; 47: 225-31.
- [8] Sigal RJ, Alberga AS, Goldfield GS, Prud'homme D, Hadjiyannakis S, Gougeon R, Phillips P, Tulloch H, Malcolm J, Doucette S, Wells GA, Ma J, Kenny GP. Effects of aerobic training, resistance training, or both on percentage body fat and cardiometabolic risk markers in obese adolescents: the healthy eating aerobic and resistance training in youth randomized clinical trial. *JAMA Pediatr* 2014; 168: 1006-14.
- [9] Wu J, Li Q, Chen L, Tian D. Clinical research on using acupuncture to treat female adult abdominal obesity with spleen deficiency and exuberant dampness. *J Tradit Chin Med* 2014; 34: 274-8.
- [10] Lin XM, Li B, Du YH, Xiong J, Sun P. Systematic evaluation of therapeutic effect of acupuncture for treatment of simple obesity. *Zhongguo Zhen Jiu* 2009; 29: 856-60.
- [11] Güçel F, Bahar B, Demirtas C, Mit S, Cevik C. Influence of acupuncture on leptin, ghrelin, insulin and cholecystokinin in obese women: a randomised, sham-controlled preliminary trial. *Acupunct Med* 2012; 30: 203-7.
- [12] Yao H, Chen JX, Zhang ZQ, Pan Y, Zheng J, Tong J. Effect of acupuncture therapy on appetite of obesity patients. *Zhen Ci Yan Jiu* 2012; 37: 497-501.
- [13] Kong XJ, Gao L, Peng H, Shi X. Effects of electro-acupuncture on expression of obestatin in hypothalamus of rats with simple obesity. *Zhong Xi Yi Jie He Xue Bao* 2010; 8: 480-5.
- [14] Yang JJ, Xing HJ, Xiao HL, Li Q, Li M, Wang SJ. Effects of acupuncture combined with diet adjustment and aerobic exercise on weight and waist-hip ratio in simple obesity patients. *Zhongguo Zhen Jiu* 2010; 30: 555-8.
- [15] Tang CL, Dai DC, Zhao GF, Zhu WF, Mei LF. Clinical observation on electroacupuncture combined with catgut implantation at acupoints for treatment of simple obesity of heart and spleen deficiency type. *Zhongguo Zhen Jiu* 2009; 29: 703-7.
- [16] Liao JQ, Song X, Chen Y, Liang LC, Wang SX. Clinical randomized controlled trials of acupoint catgut-embedding for simple obesity: a meta-analysis. *Zhongguo Zhen Jiu* 2014; 34: 621-6.
- [17] Yu C, Zhao S, Zhao X. Treatment of simple obesity in children with photo-acupuncture. *Zhongguo Zhong Xi Yi Jie He Za Zhi* 1998; 18: 348-50.
- [18] Weng CS, Hung YL, Shyu LY, Chang YH. A study of electrical conductance of meridian in the obese during weight reduction. *Am J Chin Med* 2004; 32: 417-25.
- [19] Lin CH, Lin YM, Liu CF. Electrical acupoint stimulation changes body composition and the meridian systems in postmenopausal women with obesity. *Am J Chin Med* 2010; 38: 683-94.
- [20] Ji B, Hu J, Ma S. Effects of electroacupuncture Zusanli (ST36) on food intake and expression of POMC and TRPV1 through afferents-medulla pathway in obese prone rats. *Peptides* 2013; 40: 188-94.
- [21] Yao H, Chen JX, Zhang ZQ, Pan Y, Zheng J, Tong J. Effect of acupuncture therapy on appetite of obesity patients. *Zhen Ci Yan Jiu* 2012; 37: 497-501.