

Original Article

Combined effects of astragalus soup and persistent Taiji boxing on improving the immunity of elderly women

Qing-Hua Song¹, Rong-Mei Xu¹, Quan-Hai Zhang², Guo-Qing Shen², Ming Ma¹, Xin-Ping Zhao², Yan-Hua Guo¹, Yi Wang²

¹Center of Physical Health, Henan Polytechnic University, Jiaozuo 454000, Henan Province, China; ²Lab of Human Body Science, Henan Polytechnic University, Jiaozuo 454000, Henan Province, China

Received May 19, 2014; Accepted June 28, 2014; Epub July 15, 2014; Published July 30, 2014

Abstract: Objective: To observe the combined effects of astragalus soup and persistent Taiji boxing on improving the immunity of women of advanced years. Design: 120 elderly women lacking daily exercise were chosen as the study subjects. By using the table of random numbers, they were then divided into the control group and the experiment group, consisting of 60 each. The control group practiced Taiji boxing for 45 minutes twice a day. The experiment group did the same, and, in addition, took astragalus soup after each boxing. Indexes related to physical immunity of the two groups were observed and compared when they were first chosen, when the alternative treatment was applied three, six and twelve months later, respectively. Results: The two groups demonstrated no significant differences in general data and research indexes when chosen ($P > 0.05$). Three months after the two groups were chosen and treated differently, the control group demonstrated no significant improvement while most indexes of the experiment group improved considerably ($P > 0.05$). After six months, the related indexes of both groups improved substantially ($P < 0.05$) and the improvement with the experiment was even clearer ($P < 0.05$). Twelve months later, the improvement with the experiment group was more noticeable ($P < 0.01$ or $P < 0.05$). Conclusions: In a relatively short period of three months, Taiji boxing produces no noticeable effect on the improvement of immunity in elderly women. However, when they resume the exercise for another three months and longer, Taiji boxing has a noticeable advantage and the effect is the most favorable when it is combined with astragalus soup.

Keywords: Taiji boxing, astragalus soup, immunity, the elderly, combined effect

Introduction

Modern immunology holds that immunity is the body's physiological response in recognizing and eliminating "aliens" [1]. That is, human body recognizes and eliminates any foreign invasion and, therefore, establish its own defense mechanism and maintain the stability of the internal environment. For instance, the air is abundant in such microbes as bacteria, germs, mycoplasmas, Chlamydia and fungi that become pathogens which trigger diseases when the body's immune system is weak. The reason for man to recurrently catch a cold has much to do with man's weak immune system which cannot defend the attack of the cold virus. As age increases, bodily functions decline considerably. Declining immune system definitely reduces bodily capability to guard against environmental changes. Consequently, the elderly

fall easy victim to inflammatory lesions, and their mental and physical health suffer tremendously. Related research in rehabilitation theory and practice finds that scientific workout and diet can effectively boost physical immunity. But on the other hand, it stresses the importance of appropriate methods and amount of exercise. Strenuous exercises like dash and taekwondo which are far too demanding for the elderly may easily hurt them and affect their health adversely. It is therefore highly necessary for them to choose the exercise that matches their physical ability [2, 3].

Taiji boxing features spontaneous relaxation, the combination of motion and stillness, and the integration of man and nature. Deeply rooted in the fertile soil of traditional Chinese health preservation, body building and medicine, it is a fitting exercise for the elderly [4]. Astragalus, a

Astragalus soup and Taiji boxing on immunity

Table 1. Comparison of immunity indexes 3, 6 and 12 months after subjects were chosen in control group ($\bar{x} \pm s$, n = 60)

Indexes	Control group			
	Before	3 months later	6 months later	12 months later
Ca ²⁺ concentration (mmol/l)	3.82 ± 0.53	3.77 ± 0.54	3.52 ± 0.51 ^b	3.01 ± 0.49 ^c
Bcl-2 gene expression (%)	11.10 ± 0.94	11.36 ± 0.90	11.95 ± 1.01 ^b	12.14 ± 0.97 ^c
lymphocyte apoptosis (%)	29.17 ± 4.56	29.00 ± 4.66	28.44 ± 4.39 ^b	27.71 ± 4.36 ^c
IgA (g/l)	1.86 ± 0.41	1.84 ± 0.39	2.12 ± 0.41 ^b	2.26 ± 0.39 ^c
IgG (g/l)	9.37 ± 0.72	10.15 ± 0.81	11.99 ± 0.86 ^b	12.61 ± 0.73 ^c
IgM (g/l)	1.01 ± 0.20	1.04 ± 0.22	1.29 ± 0.19 ^b	1.42 ± 0.30 ^c

Note: Six months later, two groups were compared with the time when chosen, ^bP < 0.05; twelve months later, two groups were compared with the time when chosen, ^cP < 0.05 or P < 0.01.

Table 2. Comparison of immunity indexes 3, 6 and 12 months later in the experiment group ($\bar{x} \pm s$, n = 60)

Indexes	Experiment group			
	Before	3 months later	6 months later	12 months later
Ca ²⁺ concentration (mmol/l)	3.83 ± 0.57	3.59 ± 0.51 ^a	3.21 ± 0.49 ^{b,d}	2.78 ± 0.50 ^{c,f}
Bcl-2 gene expression (%)	11.09 ± 0.89	11.71 ± 0.93 ^a	12.16 ± 0.90 ^b	12.29 ± 0.88 ^c
Lymphocyte apoptosis (%)	29.19 ± 4.71	28.52 ± 4.50	27.81 ± 4.51 ^{b,d}	26.94 ± 4.23 ^{c,f}
IgA (g/l)	1.84 ± 0.39	1.99 ± 0.40 ^a	2.30 ± 0.36 ^{b,d}	2.51 ± 0.37 ^{c,f}
IgG (g/l)	9.42 ± 0.80	10.36 ± 0.79	12.49 ± 0.68 ^b	13.75 ± 0.62 ^{c,f}
IgM (g/l)	1.03 ± 0.19	1.27 ± 0.23 ^a	1.44 ± 0.22 ^{b,d}	1.64 ± 0.25 ^{c,f}

Note: Three months later, two groups were compared with the time when chosen, ^aP < 0.05; six months later, two groups were compared with the time when chosen, ^bP < 0.05, and the experiment group was compared with the control group, ^dP < 0.05; twelve months later, two groups were compared with the time when chosen, ^cP < 0.05 or P < 0.01, and the experiment group was compared with the control group, ^fP < 0.05.

leguminous plant, often used in traditional Chinese medicine, has a recorded history of more than 2,000 years in China's pharmacopoeia. Astragalus has a known effect of improving immunity, invigorating vital energy to strength superficials and anti-aging, and it also has a broad antifungal spectrum. By observing the therapeutic effect of astragalus soup and persistent Taiji boxing combined on improving the immunity of the elderly women, this study aims to seek for an easy, effective way for them to exercise daily so as to improve their immunity, reduce disease hazards and live a healthy life. The procedures are reported below.

Materials and methods

Subjects

In June 2011, 120 elderly women from four communities in Jiaozuo City of Henan Province were randomly selected as the subjects. They were aged from 60 to 75 in relatively good health with rare or little exercises. They had not

taken immunity-regulating drugs in the past six months before they were chosen and were not allowed to take whatsoever such drugs when they received exercise therapy. By using the table of random numbers, they were divided into the control group and the experiment group, consisting of 60 each. The average age of the experiment group was (64.5 ± 5.3) years; the average age of the control group was (63.9 ± 5.5) years. The subjects were in good spirits when chosen. They had sound faculties of speaking, listening and comprehending and displayed no motor dysfunction. All participants were informed of the study and gave their consent. The subjects of the two groups showed no statistically significant differences (P > 0.05) and therefore were comparable.

Methods

The control group: did Taiji boxing only. The process: nationally popularized and simplified boxing with 24 patterns was implemented on the group. The training coaches instructed the

group in basic skills and tips for 60 minutes twice a day. In one week the subjects mastered the basics, precautions, gist and makeup of each pattern. And they were able to play boxing independently and smoothly as instructed. In the training that followed, accompanied by the background music of Taiji boxing, they exercised for 45 minutes at dawn and dusk every day for twelve months on end. The experiment group: the same amount of Taiji boxing was implemented but aided by astragalus soup. Astragalus of 30 grams was boiled with water of 1.5 to 2 liters. The subjects drank the soup of about 0.5 liter each time they had done boxing. The treatment lasted twelve months.

Main outcome measures

Indexes related to physical immunity of the two groups were observed and compared when they were first chosen, when the alternative treatment was applied three, six and twelve months later respectively. Here is the method: ① Measure Ca^{2+} concentration in the blood of the subjects with calcium fluorescence indicator when they were still; ② Determine the protein presentation of the B cell lymphoma/leukemia-2 (Bcl-2) by adopting FITC-Bcl-2 kit; ③ Assay the apoptosis rate of the lymphocytes by using the method of single stained propidium iodide (PI); ④ Use Arya360system, an analyzer produced by US Bacmkan Coulter, Inc, to measure the content of immunoglobulins IgA, IgG, and IgM in a 1:6 dilution with kinetic scattering nephelometry. All kits were original.

Statistical treatment

Apply SPSS 12.0 software to statistical treatment. The measured data were expressed in ($\bar{x} \pm s$); the comparison between groups adopted the t inspection; and $P < 0.05$ indicates that the discrepancy has statistical significance.

Results

The two groups demonstrated no significant differences ($P > 0.05$) three months after they were treated differently. The experiment group showed evidently higher indicators to Ca^{2+} concentration, Bcl-2 protein expression, IgM and IgA ($P < 0.05$) whereas no substantial improvement in IgG and lymphocytic apoptosis ($P > 0.05$).

After six months, the related indexes of both groups improved substantially (average $P <$

0.05) and the improvement with the experiment was even clearer ($P < 0.05$).

Twelve months later, the improvement with the experiment group was more noticeable compared with pre-experiment and the control group ($P < 0.01$ or $P < 0.05$) (Tables 1 and 2).

Discussion

Taiji boxing is a traditional Chinese martial arts and sports event. It is widely popular with the elderly in China for its gracefulness, its combination of force and dexterity. Studies home and abroad indicate that it can reduce fat, regulate weight, facilitate digestion and boost metabolism and cardiovascular functions [5-7]. By observing the therapeutic effect of astragalus soup and persistent Taiji boxing combined, this study has observed their co-effect on the immunity of the elderly women so as to improve their immunity, slow down their aging process and live a healthy life.

Immunoglobulins are animal proteins active in antibody. They are generated by lymphocytes of the immune system of higher animals, transformable into antibody if induced by antigens [8, 9]. Based on various structures, they can be classified into IgG, IgA, IgM and the other two types, most of which are globulins. The number of immunoglobulins affects bodily immunity. Studies on the role of exercises in inducing immunoglobulins have revealed that exercise intensity is the primary element in altering the secretion of B lymphoid cells. A lack of intensity or duration cannot alter the level of antibodies. Most studies have pointed out that long aerobics can raise the level of IgG, IgA and IgM, and reinforce bodily immunity [10-12]. Some reports have also consolidated the following findings. The measurements of immunity-related indexes of ordinary students and Taiji boxers have found that the experiment group, who practice boxing for a long time, witnesses an increased content of IgM in their serum. In addition, the content of IgG, IgA and IgM in their serum is noticeably higher than the control group before and after the exercise [13]. This study has discovered that short-term boxing (less than three months) played a very limited role in lifting the levels of IgG, IgA and IgM of the subjects ($P > 0.05$), while its advantage became obvious after six months, and became even clearer as time increased ($P < 0.05$). This study agrees

with the above findings. As is known to all, apoptosis is a physiological mechanism for the living organism to maintain its internal stability through genes-regulated death of the cells. Apoptosis can eliminate defected, decayed and mutated cells so as to balance the internal environment and keep the various organs and systems running. The related literature confirms that Ca^{2+} concentration plays a part in triggering the signaling system of apoptosis, and yet the BCL-2 gene obstructs the way of the system to sustain the survival of the cells [14]. In their study of type 2 diabetes patients, Wu Fan and his group observed that persistent Taiji boxing could remarkably enhance the patients' cytokine activity and lift the quality of their life [15]. The data of this study also confirmed the validity of their study. After more than six months' practice of Taiji boxing, the subjects, measured when still, displayed a distinctly low Ca^{2+} concentration, a high protein expression of BCL-2 and a slow apoptosis compared with the time when they were first chosen. This particular study attests that more than six months' practice of Taiji boxing has brought about adaptive changes, reduced apoptosis, stabilized the activity of the cells and slowed down the aging process of the elderly women.

Astragalus, a perennial leguminous plant, grows in northern China. An edible health product of Mother Nature, astragalus contains such nutrients as polysaccharide, sitosterol, palmitic acid, choline and flavonoid. It calms down the central nervous system, and clears lipid peroxide as an effective antioxidant. It was claimed to be the most effective medicine to invigorate vital energy in the harem in the Qing Dynasty. In folklores the well-known proverb, "A bowl of astragalus soup a day keeps the doctor away", sheds light on its medical value. Modern medical research has manifested that astragalus can expand coronaries, improve myocardial blood supply, boost immunity, and slow down cellular senescence. Wang et al [16] proved that astragalus could substantially boost the cell-mediated immunity, humoral immunity and macrophage', capacity of normal rats. Zhang et al [17] and Chen et al [18] also observed that astragalus could regulate the immune mechanism and interfere in the release of macrophages. It could induce the deaths of tumor cells in many ways without doing any toxic harm to normal cells. This study observed the experiment group, who did Taiji boxing with a follow-

up of astragalus soup, and compared it with the control group, who did boxing only, and found that, after three months, the control group demonstrated no significant improvement ($P > 0.05$), while most indexes of the experiment group improved considerably ($P < 0.05$). Six and twelve months later, the related indexes of both groups improved substantially ($P < 0.05$) and the improvement with the experiment was even clearer compared with the time when chosen and with the control group ($P < 0.01$ or $P < 0.05$). The findings suggest that immunity indexes of the experiment group have improved a lot compared with the control group.

To conclude, persistent and long-term Taiji boxing can indeed improve the immunity, slow down the aging process and contribute to a long and healthy life of the elderly, and its effect is the most favorable when it is combined with astragalus soup.

Acknowledgements

This study was supported by the Planning Office of Chinese Social Science (13BTY058); Science and Technology Department of Henan Province (142700410395).

Disclosure of conflict of interest

None.

Address correspondence to: Dr. Rong-Mei Xu, Health Center of Physical Education Institute, Henan Polytechnic University, 2001 Shiji Road, Jiaozuo 454000, Henan Province, China. Tel: +86-18236886388; +86-13633915976; E-mail: rmxu-2001@126.com (RMX); sqh@hpu.edu.cn (QHS)

References

- [1] Bleiblo F, Michael P, Brabant D, Ramana CV, Tai T, Saleh M, Parrillo JE, Kumar A, Kumar A. The role of immunostimulatory nucleic acids in septic shock. *Int J Clin Exp Med* 2012; 5: 1-23.
- [2] Valdés-Ramos R, Martínez-Carrillo BE, Aranda-González II, Guadarrama AL, Pardo-Morales RV, Tlatempa P, Jarillo-Luna RA. Diet, exercise and gut mucosal immunity. *Proc Nutr Soc* 2010; 69: 644-50.
- [3] Liang Y, Xie XW, Liu YF, Yao JM. Effect of diet control combined with aerobic exercise on the metabolic syndrome. *Zhong Nan Da Xue Xue Bao Yi Xue Ban* 2007; 32: 671-4.
- [4] Song QH, Shen GQ, Xu RM, Zhang QH, Ma M, Guo YH, Zhao XP, Han YB. Effect of Tai Chi exer-

Astragalus soup and Taiji boxing on immunity

- cise on the physical and mental health of the elder patients suffered from anxiety disorder. *Int J Physiol Pathophysiol Pharmacol* 2014; 6: 55-60.
- [5] Yang Y, Verkuilen J, Rosengren KS, Mariani RA, Reed M, Grubisich SA, Woods JA, Schlagal B. Effects of a traditional Taiji/Qigong curriculum on older adults' immune response to influenza vaccine. *Med Sport Sci* 2008; 52: 64-76.
- [6] Chiang J, Chen YY, Akiko T, Huang YC, Hsu ML, Jang TR, Chen YJ. Tai Chi Chuan increases circulating myeloid dendritic cells. *Immunol Invest* 2010; 39: 863-73.
- [7] Song QH, Xu RM, Shen GQ, Zhang QH, Ma M, Zhao XP, Guo YH, Wang Y. Influence of Tai Chi exercise cycle on the senile respiratory and cardiovascular circulatory function. *Int J Clin Exp Med* 2014; 7: 770-774.
- [8] Rook AH, Raphael BA. Progress in immunotherapy of cancer. *N Engl J Med* 2012; 367: 1168.
- [9] Xing JQ, Zhou Y, Fang W, Huang AQ, Li SB, Li SH, Ruan LM. The effect of pre-competition training on biochemical indices and immune function of volleyball players. *Int J Clin Exp Med* 2013; 6: 712-5.
- [10] Sasaki S, Matsuura T, Takahashi R, Iwasa T, Watanabe H, Shirai K, Nakamoto H, Goto S, Akita S, Kobayashi Y. Effects of regular exercise on neutrophil functions, oxidative stress parameters and antibody responses against 4-hydroxy-2-nonenal adducts in middle aged humans. *Exerc Immunol Rev* 2013; 19: 60-71.
- [11] Navarro F, Bacurau AV, Pereira GB, Araújo RC, Almeida SS, Moraes MR, Uchida MC, Costa Rosa LF, Navalta J, Prestes J, Bacurau RF. Moderate exercise increases the metabolism and immune function of lymphocytes in rats. *Eur J Appl Physiol* 2013; 113: 1343-52.
- [12] Trushina EN, Mustafina OK, Nikitiuk DB, Kuznetsov VD. Immune dysfunction in highly skilled athletes and nutritional rehabilitation. *Vopr Pitan* 2012; 81: 73-80.
- [13] Field T. Tai Chi research review. *Complement Ther Clin Pract* 2011; 17: 141-6.
- [14] Dremina ES, Sharov VS, Schöneich C. Heat-shock proteins attenuate SERCA inactivation by the anti-apoptotic protein Bcl-2: possible implications for the ER Ca²⁺-mediated apoptosis. *Biochem J* 2012; 444: 127-39.
- [15] Yeh SH, Chuang H, Lin LW, Hsiao CY, Eng HL. Regular tai chi chuan exercise enhances functional mobility and CD4CD25 regulatory T cells. *Br J Sports Med* 2006; 40: 239-43.
- [16] Yu HL, Yu QS, Pan JF. Effect of qihuang decoction on epithelial cell apoptosis of ischemia/reperfusion injured intestinal mucosa in rat. *Zhongguo Zhong Xi Yi Jie He Za Zhi* 2009; 29: 1096-9.
- [17] Hong SK, Kim WG, Choi HW, Lee YK, Shim HS. Occurrence of Violet Root Rot on Membranous Milk Vetch Caused by *Helicobasidium mompa* in Korea. *Mycobiology* 2011; 39: 321-3.
- [18] Qu ZH, Yang ZC, Chen L, Lv ZD, Yi MJ, Ran N. Inhibition airway remodeling and transforming growth factor- β 1/Smad signaling pathway by astragalus extract in asthmatic mice. *Int J Mol Med* 2012; 29: 564-8.