Hemorheological, Blood Fat, and Immunological Indexes

Effects on the Hemorheological, Blood Fat, and Immunological Indexes of Old and Middle-Aged People

Health Qigong•Wu Qin Xi imitates the power of the tiger, the ease of the deer, the steadiness of the bear, the nimbleness of the ape, and the agility of the bird, strives to contain the verves of these five animals, coordinates mind and Qi, integrates the interior and exterior, preserves health, strengthens the body constitution, significantly prevents and control diseases, and implicates the dialetrical thoughts like “unity between heaven and man” and “overall point of view”. This study aims to verify the health-preserving effect of Health Qigong•Wu Qin Xi through testing of some hemorheological, blood fat, and immunological indexes before and after the exercise, and thus provide scientific basis for the comprehensive popularization of Wu Qin Xi from the biochemical point of view.

1. Objects and methodology

1.1 Experimental objects

After inquiry and examination, 100 old and middle-aged residents without long-term history of exercise or several organic diseases were selected from Yinxing Street of Yangpu District and Wujiaochang Town of Shanghai. 30 of them were males with an average age of 61.6±3.8 years and 70 were female with an average age of 58.5±4.1 years. These objects were divided into two groups, each containing 15 males and 35 females. One of them was defined as the experimental group which took Health Qigong•Wu Qin Xi exercise and the one was a control group which did not participate in any physical fitness activities.

1.2 Research methods

(1) Training of exercising methods

The experimental group practiced Health Qigong•Wu Qin Xi 3~4 times every morning for about 45 min at least 4 times per week. The exercise lasted for 6 consecutive months. The control group participated in no physical exercise of any form. The blood biochemical indexes of the experimental group were tested respectively before the experiment, after 3 months of experiment, and after 6 months of experiment and the blood biochemical indexes of the control group were tested respectively before the experiment and 6 months after the experiment.

(2) Tested indexes:

Immunological indexes: Natural killer cells (NK), CD4+, CD8+, CD4+/CD8+ ratio, and TLC count (CD3+);

Blood fat indexes: total cholesterol (TC), triglyeride (TG), high density lipoprotein (HDL), low density lipoprotein (LDL);

Blood cell indexes: Hemoglobin (HB), red blood cell (RBC), white blood cell (WBC), blood platelet (PLA).

(3) Test method

Venous blood was taken from the elbows of both groups in the resting state before and after the experiment, anti-coagulated with heparin, cold-stored, and delivered within 2 hours to Immunology Lab of Second Military Medical University. Double fluorescent labeling was used for tests of T-cells and subgroups; enzymic method was used for blood fat testing; pulse resistance method was used for RBC count; hydroferric cyanhaemoglobin colorimetry was used for determination of HBG. A full-automatic blood cell analyzer and its matching reagents were used for determination and analysis.

(4) Instruments

722 grating spectrophotometer (Shanghai General Analytical Instrument Works; Shanghai Precision & Scientific Instrument Co., Ltd), FACSCalibur flow cytometer (USA), full-automatic blood cell analyzer (Model: 4500sysmex, Japan), full-automatic biochemical analyzer (Model: Hitachi 7170A, Japan) Thermostat waterbath cauldron (Model: DK600 Shanghai Shenxian Thermostat Equipment Factory).

(5) Statistical methods

SPSS11.0 statistical software was used to process data. Pairing t-test was used for analytical comparison. The results were expressed with “mean ±standard deviation”. $p<0.05$ stood for significant levels and $p<0.01$ stood for extremely significant levels.

2. Results

2.1 Efficacy after 3 months of Health Qigong•Wu Qin Xi exercise

(1) Changes in immunological indexes

CD8+ of the male test objects in the experimental group was significantly reduced (P 0.01) and their CD4+/CD8+ ratio was significantly raised (P 0.05); no significant changes were detected in other indexes. NK activity of the female test objects in the experimental group was significantly enhanced; their CD4+ was significantly raised (P 0.05); their CD8+ was reduced; their CD4+/CD8+ ratio was significantly raised (P 0.05); see Table 1 for details.

Table 1. Changes in Immunological Indexes after 3 Months of Exercise

MaleFemale

NBefore experiment3 monthsNBefore experiment3 months

NK(%)1322.02±10.5524.49±12.553423.31±12.3727.87±14.15*

CD3+ (%)1353.15±12.2249.38±12.183448.78±14.8147.22±13.05

CD4+ (%)1342.60±9.9144.60±13.343439.01±7.8143.20±9.07*

CD8+ (%)1328.98±7.0620.62±6.14**3432.01±6.7923.76±6.67**

CD4+/ CD8+131.68±1.012.52±1.79*341.34±0.622.06±1.04**

Notes: *stands for significant difference P<0.05 and ** stands for highly significant difference P 0.01.(Same as below).

(2) Changes in blood fat indexes

TG of the male test objects in the experimental group was reduced and the difference was highly significant (P 0.01); no significant changes were detected in other indexes. TC, LDL, and HDL of females were raised with significant differences (P<0.05), but the HDL/LDL ratio tended to rise; their TG was reduced and the difference was highly significant (P<0.01). See Table 2.

Table 9.2-2 Changes in Blood Fat Indexes (mmol/L) after 3 Months of Exercise

IndexMaleFemale

NBefore experiment3 monthsNBefore experiment3 months

TC (mmol/L)134.65±0.684.68±0.58345.05±0.925.17±0.88*

TG (mmol/L)131.04±0.360.89±0.23**341.75±1.271.10±0.69**

HDL (mmol/L)131.14±0.231.22±0.25341.33±0.381.48±0.36*

LDL (mmol/L)132.80±0.473.02±0.46342.77±0.703.04±0.69*

HDL/LDL130.415±0.0830.413±0.107340.493±0.1300.509±0.169

(3) Changes in blood routine indexes

The HGB and RBC of males in the experimental group were significantly raised with significant differences (P<0.05). No differences were detected in the indexes of females. See Table 3 for details.

Table 3. Changes in Blood Cell Indexes after 3 Months of Exercise

IndexMaleFemale

NBefore experiment3 monthsNBefore experiment3 months

WBC (109/L)136.61±1.726.23±1.49345.82±1.245.45±1.38

RBC (1012/L)134.57±0.544.98±0.25*344.39±0.364.38±0.42

Hemoglobin (g/L)13150.3±10.5155.2±9.4*34131.7±15.3132.4±15.2

BP (×109/L)13215.7±40.6220.1±46.734219.9±68.1220.0±67.4

2.2 Efficacy after 6 months of Health Qigong•Wu Qin Xi exercise

(1) Changes in immunological indexes

NK activity of the male test objects in the experimental group was raised, CD8+ was reduced, and their CD4+/CD8+ ratio was raised with significant differences (P 0.05); no significant changes were detected in other indexes. CD8+ of the males in the control group was significantly reduced (P<0.05) but no significant change was detected in their CD4+/CD8+ ratio. See Table 4 for details.

Table 4. Changes in Immunological Indexes of Males in Both Groups after 6 Months of Exercise

IndexExperimental groupControl group

NBefore experiment6 monthsNBefore experiment6 months

NK(%)1221.99±11.0229.04±11.46*1523.69±8.2424.24±8.73

CD3+ (%)1252.95±12.7452.06±7.551555.02±6.7855.08±6.39

CD4+ (%)1243.89±9.1545.51±11.111538.10±7.2233.08±11.67

CD8+ (%)1228.56±7.2023.13±8.44*1530.57±6.7226.19±5.12*

CD4+/CD8+121.75±1.022.24±1.71*151.37±0.651.27±0.39

NK activity of the female test objects in the experimental group was raised and their CD3+ was raised with significant differences (P<0.05); their CD8+ was reduced and their CD4+/CD8+ ratio was raised with significant differences (P 0.01); no significant changes were detected in other indexes. No differences were detected in any of the indexes of females in the control group. See Table 5 for details.

Table 5. Changes in Immunological Indexes of Females in Both Groups after 6 Months of Exercise

IndexExperimental groupControl group

NBefore experiment6 monthsNBefore experiment6 months

NK(%)3423.31±12.3727.86±15.65*3524.96±6.7926.82±7.25

CD3+ (%)3448.78±14.8152.05±13.98*3553.92±10.7351.24±9.65

CD4+ (%)3439.46±8.1339.82±9.933538.06±7.1638.64±9.17

CD8+ (%)3432.01±6.7927.94±9.27**3532.61±6.9233.72±5.82

CD4+/CD8+341.34±0.621.72±1.19**351.24±0.431.18±0.43

(2) Changes in blood fat composition

No differences were detected in any of the indexes of males in the experimental group. TC and LDL levels of the male test objects in the control group were raised with significant differences ($P<0.05$) but the HDL/LDL ratio did not increase; no significant changes were detected in other indexes. See Table 6.

Table 6. Changes in Blood Fat Indexes (mmol/L) of Males in Both Groups after 6 Months of Exercise

IndexExperimental groupControl group

NBefore experiment6 monthsNBefore experiment6 months

TC (mmol/L)124.62±0.694.51±0.51154.37±1.014.90±1.19*

TG (mmol/L)120.98±0.320.93±0.20151.42±0.861.44±0.65

HDL (mmol/L)121.14±0.241.11±0.19151.12±0.241.14±0.22

LDL (mmol/L)122.79±0.492.90±0.43152.69±0.833.01±1.02*

HDL/LDL120.415±0.0870.390±0.083150.450±0.1550.426±0.190

TG of female test objects in the experimental group was reduced with a very significant difference ($P<0.01$). Their LDL level was raised with a significant difference ($P<0.05$). No significant changes were detected in HDL/LDL ratio or any other index. TC and LDL levels of the male test objects in the control group were raised with significant differences ($P<0.05$) but the HDL/LDL ratio was reduced with a significant difference ($P<0.05$); no significant changes were detected in other indexes. See Table 7.

Table 7. Changes in Blood Fat Indexes (mmol/L) of Females in Both Groups after 6 Months of Exercise

IndexExperimental groupControl group

NBefore experiment6 monthsNBefore experiment6 months

TC (mmol/L)345.05±0.924.98±0.8354.86±1.025.42±1.12*

TG (mmol/L)341.75±1.271.19±0.52**351.40±0.721.67±1.29

HDL (mmol/L)341.33±0.381.38±0.37351.22±0.271.28±0.22

LDL (mmol/L)342.77±0.703.04±0.68*352.92±0.823.31±0.85**

HDL/LDL340.493±0.1300.467±0.136350.446±0.1480.412±0.127*

(3) Changes in blood routine indexes

No differences were detected in any of the indexes of males in the experimental group. But their RBC tended to rise and their blood platelet tended to fall. No differences were detected in any of the indexes of the control group. See Table 8 for details.

Table 8. Changes in Blood Routine Indexes of Males in Both Groups after 6 Months of Exercise

IndexExperimental groupControl group

NBefore experiment6 monthsNBefore experiment6 months

WBC (109/L)126.48±1.735.60±0.69156.55±1.696.17±1.53

RBC (1012/L)124.54±0.554.75±0.23154.67±0.404.78±0.43

Hemoglobin (g/L)12149.8±10.8149.0±8.715148.2±16.4139.8±41.8

BP (×109/L)12215.7±40.6204.2±42.915209.7±34.5195.4±35.4*

WBC and blood platelet of the female test objects in the experimental group were reduced with significant differences (P 0.05); no significant changes were detected in other indexes. The WBC of the control group was reduced with a significant difference (P<0.05). See Table 9 for details.

Table 9. Changes in Blood Routine Indexes of Females in Both Groups after 6 Months of Exercise

IndexExperimental groupControl group

NBefore experiment6 monthsNBefore experiment6 months

WBC (109/L)345.82±1.244.99±1.02*355.23±1.364.73±1.23*

RBC (1012/L)344.39±0.364.33±0.47354.25±0.354.28±0.31

Hemoglobin (g/L)34131.7±15.3121.9±49.735133.8±10.3133.0±9.4

BP (×109/L)34219.9±68.1190.6±59.7*35200.5±53.0192.7±53.5

3. Discussion

3.1 Effects of Health Qigong•Wu Qin Xi exercise on the immunological regulation functions of old and middle-aged people

NK cells are an important part of innate immunity. They play widespread roles in the defense system of the host, especially in the immunity to tumors. Long-term aerobic exercise with moderate intensity will increase the activity of NK cells. After 3 months of Health Qigong•Wu Qin Xi exercise, the NK activity of female objects in the experimental group was raised. After 6 months, the NK activity of both the male and female experimental group was significantly raised and the difference was statistically significant.Results of this experiment indicate that long-term Health Qigong•Wu Qin Xi exercise can enhance the activity of NK cells of test objects and improve the natural immunity of the organism.

After 3 months and after 6 months of Health Qigong•Wu Qin Xi exercise, the CD4+/CD8+ ratios of both male and female objects in the experimental group were raised and their CD8+ levels were both reduced. After 3 months of exercise, the CD4+ of female test objects was raised. After 6 months of exercise their CD8+ was reduced. Both changes were statistically significant. This indicated that after 3 months, the T-cell immunological regulation of female test objects was mainly dependent of the increase of CD4+ and after 6 months, it was mainly dependent on the decrease of CD8+. When it comes to males, they always depended on the decrease of CD8+ to regulate immunological equilibrium.

Results of this experimented indicate that long-term and moderate Health Qigong•Wu Qin Xi exercise can effectively raise the CD4+/CD8+ ratio of test objects, keep their CD4+ at a normal level, and increase the total number of T-cells to some extent. On the whole, it has active regulating effects on the immunity of the organism.

It has been proved in physiology that the thoughts and thinking activities of man can influence the autonomic nerve system through the central nervous system of the brain and thus regulate the activities of internal organs. Mind regulation enhances the regulating effect of the brain on autonomic nerves and glandular organs, improves the secretion functions of these glandular organs, regulates the secretion of hormones, and influences the distribution of T-cell subgroups in peripheral blood of the organism. Health Qigong•Wu Qin Xi requires the exerciser to eliminate all emotional changes and distracting thoughts that are unfavorable for physical health, enter the state of Health Qigong•Wu Qin Xi exercise, and thus resist the adverse stimulations of all kinds of external factors on the organism and regulate the immunological equilibrium mechanism of the old and middle-aged people.

3.2 Effects of Health Qigong•Wu Qin Xi exercise on the blood lipid metabolism of old and middle-aged people

After 3 months of Health Qigong•Wu Qin Xi exercise, the TC and HDL of female test objects in the experimental group were significantly raised and their TG was significantly reduced. Although their LDL was significantly raised too, their HDL/LDL ratio tended to increase. TG of male test objects was significantly reduced. Although changes in other indexes were not statistically significant, they also changed with the same trend. After 6 months of Health Qigong•Wu Qin Xi exercise, no significant change was detected in any index of the male test objects in the experimental group. The TC and LDL levels of the control group were significantly raised but their HDL/LDL ratios did not increase. TG of female test objects was reduced with a very significant difference and their LDL level was raised, but their HDL/LDL did not increase. The TC and LDL levels of the control group were significantly raised and their HDL/LDL ratio was significantly reduced.

Aerobic exercise influences lipid metabolism by reducing the TC and TG levels in blood plasma. It promotes the transportation and decomposition of TG and may cause the increase of HDL-C and the decrease of LDL-C in blood by enhancing the anti-phase transportation capacity of cholesterol to increase the HDL-C/LDL-C ratio, facilitate the transportation of peripheral cholesterol to the liver and its decomposition, and thus promote the improvement of lipid metabolism in the organism and alleviate the occurrence and development of cardiovascular and cerebrovascular diseases.

The experiment indicates that long-term Health Qigong•Wu Qin Xi exercise can effectively reduce the TG levels and regulate the lipid metabolism of old and middle-aged women but is not more effective than long-term exercise, probably due to the adaptation to exercise. In this experiment, the blood fat regulation effect was not significant on old and middle-aged males, probably because all old and middle-aged males selected in this experiment had normal blood fat levels. With the advance of age, the old and middle-aged objects in the control group showed natural decline of the metabolic regulation ability. As

old and middle-aged females had more serious lipid metabolism disorder than males, they might respond more significantly to Health Qigong•Wu Qin Xi exercise. And males could maintain their original status and slow down their decline. Therefore the experimental results show that Health Qigong•Wu Qin Xi exercise has active effects on the blood lipid metabolism of old and middle-aged people.

3.3 Effects of Health Qigong•Wu Qin Xi exercise on the hemorheology of old and middle-aged people

After 3 months of Health Qigong•Wu Qin Xi exercise, the HBG and RBC of male objects in the experimental group were significantly raised while no significant differences were detected in any of the indexes of female objects. After 6 months of Health Qigong•Wu Qin Xi exercise, the WBC and blood platelet levels of female objects in the experimental group were reduced. No significantly differences were detected in the indexes of male objects. Results of this experiment showed that short-term Health Qigong•Wu Qin Xi exercise had significant effect on the oxygen-carrying capacity of the blood of old and middle-aged test objects and the effect was stronger on males than on females. It could improve the immunological stringent state and reduce blood viscosity of old and middle-aged females.

References

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