Original Article

Research on the Influence Mechanism of Winter Swimming Exercise on the Cardiovascular System in the Middle-aged and Elderly

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Abstract

Objectives: The aim of the study is to investigate the effect of winter swimming on cardiovascular function in the middle-aged and elderly men. **Methods:** Thirty cases were included in the control group and seventy cases were in the winter swimming group. The control group and swimming group were 60–69 years of age in the elderly. The winter swimming group was followed for 1 year and the control group carried out an index test the same year. Four items of blood lipid, electrocardiogram, and cardiac function parameters were selected as index. **Results:** The high-density lipoprotein cholesterol of the winter swimming group was significantly higher than that of the control group ($P < 0.05$), but there was no significant difference in low-density lipoprotein cholesterol, total cholesterol, and triglyceride ($P > 0.05$); the comparison of serum cytokines were weak but in a positive direction. **Conclusions:** Long-term insist to winter swimming can make the heart to adapt to the morphological changes, improve cardiac function, improve myocardial blood supply, improve blood lipid metabolism, and reduce the risk of Arsenic (AS).

Keywords: Blood lipid metabolism, cardiovascular, serum cytokines, winter swimming

Introduction

Winter swimming is known as "vascular gymnastics," has always been considered as the most effective exercise to enhance the cardiovascular system, deeply loved by the elderly.[1] To make people's understanding of winter swimming in national fitness activities from the perceptual stage to rational stage, the wide development of winter swimming fitness should be promoted. In this paper, XXC-D type cardiovascular function tester, Japanese photoelectric 7503 three-lead electrocardiogram machine, RGZ-RT scale, and automatic biochemical analyzer (enzymatic) were used to select electrocardiogram, blood viscosity, etc., The effects of winter swimming on cardiovascular function were investigated in forty middle-aged and elderly people who took part in winter swimming with physiological and biochemical indexes such as blood lipids.[2,3]

Overview

In this paper, high-density lipoprotein (HDL) can promote cholesterol transport and anti-a/s and has high sensitivity in predicting cardiovascular disease. The level of HDL in the elderly with long winter swimming was significantly higher than that in the nonexercise ($P < 0.05$), which shows that long-term winter swimming can increase the level of High-density lipoprotein cholesterol (HD l), thus limiting the accumulation of cholesterol in arterial smooth muscle cells and promoting its elimination, thus protecting the arterial wall? At the same time, the increase of HDL level can improve the ability of muscle to ingest glucose and fatty acids, improve the utilization rate of glucose and fatty acids in muscle, thus improve the level of lipoprotein metabolism, and play a certain role in preventing atherosclerosis. According to the previous studies, ST-segment decline was closely related to myocardial ischemia in electrocardiogram load exercise test(8). The results showed that the decreasing degree of ST-segment in the control group was significantly higher than that in the

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winter swimming group. This suggests that long-term winter swimming can improve blood circulation, improve heart function, increase cardiac contractility, increase cardiac output, dilate coronary arteries, and improve blood flow. On the other hand, it can improve blood lipid metabolism, reduce blood lipid, increase HD l content, prevent a/s, improve coronary blood flow, and make myocardial blood supply relatively adequate through winter swimming.

Methods

Forty winter swimmers aged 50–78 years were sampled from Xiamen by random sampling. The participants included 28 males and 12 females who had experienced winter swimming for more than 1 year. 1.2 the time of the experiment was compared with that of the winter swimmer before the winter swimming season (November 1, 2008) and after the winter swimming season (January 1, 2009), during which the maximum temperature was 20°C and the lowest temperature was −1°C. The highest water temperature is 20°C, the lowest is 9°C, and the average is 14°C. 1.3 methods before and after entering the winter swimming season, the participants were examined by the Japanese photoelectric 7503 three-lead electrocardiograph scale and the automatic biochemistry analyzer (enzymatic), respectively, and measured their height and weight, and the results showed that before and after entering the winter swimming season, the participants were examined by the instruments such as RGZ-RT scale and automatic biochemical analyzer (enzymatic). Electrocardiogram, blood biochemistry, and blood lipids were measured, then arterial blood pressure was measured with XXC-D cardiovascular function tester, pulse images were depicted, pulse waves were amplified and printed, and height and weight were input.[4] After four parameters of systolic blood pressure and diastolic blood pressure can be measured and input parameters can be automatically calculated by microcomputer according to pulse icon and 20 items of hem rheological parameters related to the cardiovascular system are printed out for clinical diagnosis and analysis [Figure 1].

There is no doubt that winter swimming exercise can improve the function of the cardiovascular system and improve the physical and mental health of the elderly. However, intense cold irritation can also trigger a series of uncomfortable reactions that increase the body's load during exercise. Other studies have shown that thyroid hormones, adrenocortical hormones, angiotensin, and testosterone are significantly increased during winter swimming.[5] Therefore, especially for the elderly, due to the decline of their own function and low regulating function, it is necessary to take part in the winter swimming exercise according to their own health condition, pay attention to the safety and hygiene requirements of winter swimming exercise, and strengthen medical supervision at the same time. Do not blindly participate to avoid adverse consequences or even lead to sudden cardiac death. Before taking part in winter swimming, we should have a comprehensive physical examination, especially the examination of cardiovascular and cerebrovascular system. People with more serious diseases, such as hypertension, congenital heart disease, rheumatic heart valve, epilepsy, and so on, should not take part in winter

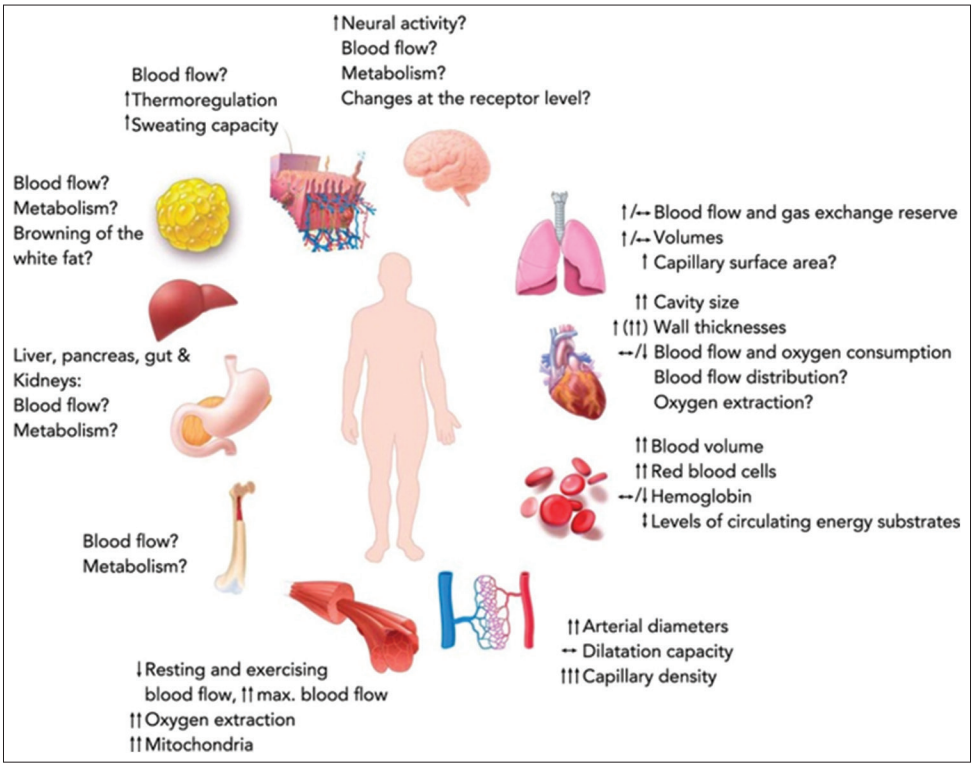

Figure 1: Effects of swimming on human body function

swimming. Liu Guiyang reported three cases of sudden death of elderly winter swimming enthusiasts, including one case of sudden death of recessive coronary heart disease and two cases of sudden death of heart disease (both with hypertension). Even if the good health of the winter swimming, there should be a gradual process, so that the body gradually adapt, it is important to persevere. Before taking part in the winter swimming, we should pay attention to the following: (1) make adequate preparations before launching; (2) be full of food, hungry, and it is not suitable for winter swimming when fatigue or body is not timely; (3) it is not appropriate to drink alcohol before and after winter swimming for heating; and (4) because of the high energy consumption in the body, it is harmful to the body at most once a day or every other day; otherwise, it is harmful to the body [Figure 2].

Winter swimming can increase the cardiac output per stroke. The winter swimmer's heart pumps out the same amount of blood as the control group with a larger stroke output and a smaller heart rate, thus reducing the oxygen consumption of the heart itself. Therefore, the myocardial energy of winter swimmers can be used more effectively; the heart rate can be lower to meet the needs of metabolism, and the storage capacity of the heart has been strengthened. When the participants reached the maximum heart rate, the cardiac output and maximal oxygen intake in the winter swimming group were significantly higher than those in the control group ($P < 0.05$). Fox suggested that there was no significant difference in the maximal heart rate and maximal oxygen content between those with and without training, but there was a significant difference in maximal oxygen intake. The main reason is that the output per stroke of the trainer was significantly higher than that of the untrained. The results showed that after long-term swimming, the cardiac volume increased, the cardiac contractility increased, and the cardiac output increased. This result was consistent with the conclusion of fox. Higher cardiac output can satisfy the supply of oxygen and nutrients during high-intensity exercise.[6]

Results

Winter swimming can improve cardiovascular function. The results of the cardiovascular mechanical energy test before and after winter swimming season showed that the pulse rate, left ventricular index (LVI), and myocardial oxygen consumption (MVO2) were significantly decreased in the middle- and old-aged people by persisting in winter swimming exercise (SV). Cardiac index (SI) and cardiac index (CL) increased significantly. This indicates that winter swimming can effectively improve vascular wall elasticity and prevent arteriosclerosis in middle-aged and elderly people. This is consistent with the results of Wang he and Jib Lipping. The possible mechanisms are as follows. Cold stimulation of the whole body blood canal is the ideal alternate movement to

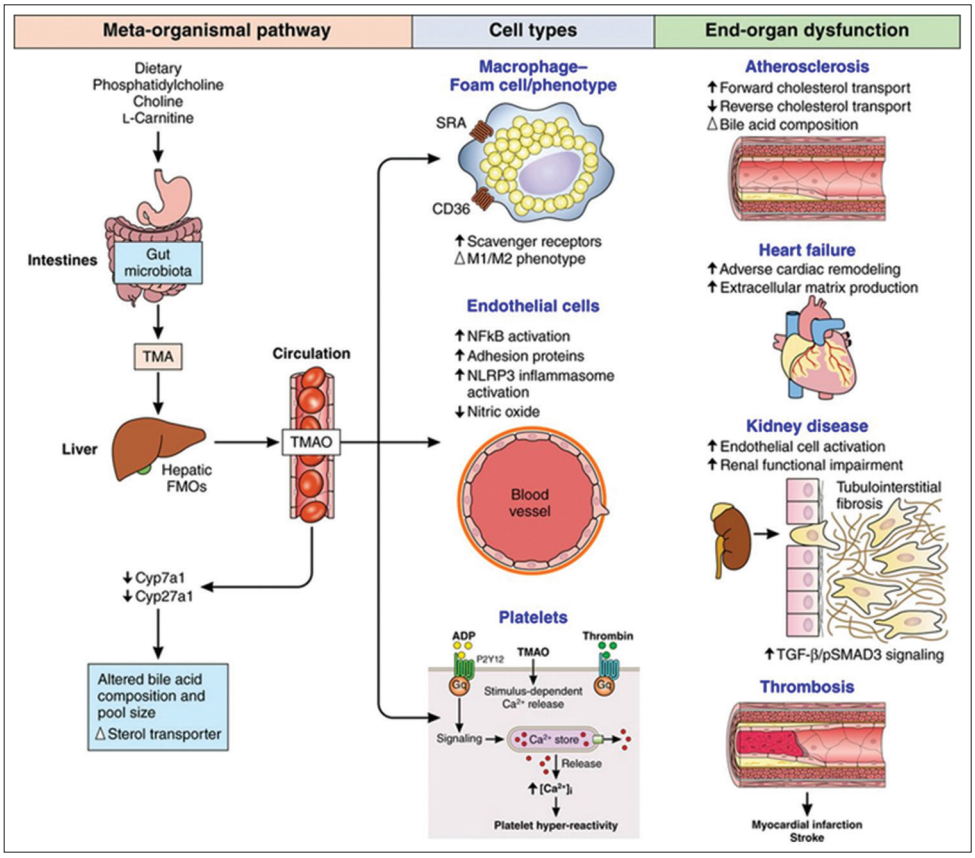

Figure 2: Effects of swimming on whole body cardiovascular system

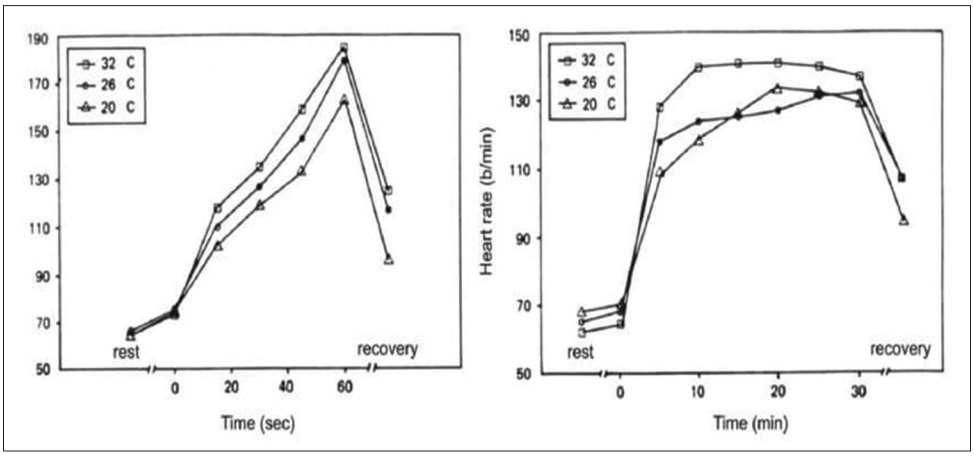

Figure 3: Comparison of the effects of winter swimming on the elderly

the circulatory system. Cold stress in winter swimming can also regulate the balance of excitation and inhibition in the central nervous system, which is beneficial to planting. The function of the physical nervous system is improved. Winter swimming exercise can also make superficial blood vessels dilate, blood pressure decrease, peripheral resistance decrease, alleviate the decline trend of vascular flow in the middle-aged and old people, make the organs get more blood supply, and can effectively enhance the contractility of the heart. At the same time, the speed of blood flowing through the tissue was slowed down, which was beneficial to the tissue cells to get better substance exchange [Figure 3]. Winter swimming can also delay the pulmonary artery elasticity, dilation, and increase of blood flow resistance of pulmonary blood vessel bed, which can reduce the cardiac load, decrease myocardial oxygen consumption, and increase energy utilization rate. The phenomenon of economization of cardiac blood tube activities makes the body to have better rest and has greater potential when exercising, thereby improving and postponing the aging of cardiovascular function, effectively preventing and treating cardiovascular diseases, and achieving fitness and strength.

Conclusions

Winter swimming can improve cardiovascular function of the middle and old-aged people and also in winter swimming season, the value of decreases and the value of codon is not significantly different. Winter swimming can improve the viscosity and has a certain significance in preventing HVS in the middle and old age, and there is no significant difference between winter swimming and winter swimming in the prevention of HVS in the middle and old age, but there is no significant difference between winter swimming and winter swimming in the prevention of HVS in the middle and old age, but there is no significant difference between winter swimming and winter swimming in improving the viscosity. In the winter swimming season, the HCTL HB value increased compensatory, while it was not significantly different from that before winter swimming season. Winter swimming can reduce blood lipid and increase HDL-cholesterol concentration and prevent coronary artery atherosclerosis in middle-aged and elderly people to prevent coronary artery atherosclerosis. Winter swimming can accelerate renal blood flow, reduce angiotensin I secretion, improve cardiovascular function, enhance cardiovascular compliance, and prevent and reduce the occurrence of hypertension and arteriosclerosis. To improve the health and prolong life, the elderly should take part in winter swimming exercise according to their own health condition, pay attention to safety and hygiene requirements of winter swimming exercise, and strengthen medical supervision at the same time. Do not blindly participate to avoid adverse consequences or even lead to sudden cardiac death.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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