

## Effect of eight weeks of swimming on cardiovascular health: Reduction of risk factors in middle-aged men with hypertension

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### Abstract

The aim of this study was to determine the effect of a swimming training course on cardiovascular risk factors in 50-60 year old men with high blood pressure. For this purpose, 20 hypertensive men aged  $54.95 \pm 3.18$  years, height  $174.05 \pm 18.5$  cm and weight  $82.20 \pm 5.36$  kg were selected in a targeted manner and they were randomly selected. They were placed in two groups of swimming training and control (10 people in each group). The swimming training group participated in an 8-week swimming training program. Aerobic swimming training with an intensity of 70% of the maximum heart rate, three sessions per week and 15 minutes in the first week, which gradually reached 45 minutes in the last week. During this period, the control group did not follow any regular physical activity program and only did their normal daily activities. Blood pressure, resting heart rate, body weight, cholesterol, triglyceride, LDL and HDL serum levels were evaluated before and after the intervention. Student's t statistical method for dependent and independent groups was also used for intra-group and inter-group comparison of variables, respectively. The results showed that a period of swimming training decreased weight, cholesterol, triglycerides, LDL, resting heart rate and blood pressure, as well as increased HDL in 50-60-year-old men with high blood pressure ( $P < 0.05$ ). Therefore, based on these findings, it is concluded that a course of swimming training improves the profile of blood lipids and blood pressure in elderly men with high blood pressure, and since high blood pressure threatens health and heart attacks, swimming training can improve the health of old and elderly men is beneficial. The aim of this study was to determine the effect of a swimming training course on cardiovascular risk factors in 50-60 year old men with high blood pressure. For this purpose, 20 hypertensive men aged  $54.95 \pm 3.18$  years, height  $174.05 \pm 18.5$  cm and weight  $82.20 \pm 5.36$  kg were selected in a targeted manner and they were randomly selected. They were placed in two groups of swimming training and control (10 people in each group). The swimming training group participated in an 8-week swimming training program. Aerobic swimming training with an intensity of 70% of the maximum heart rate, three sessions per week and 15 minutes in the first week, which gradually reached 45 minutes in the last week. During this period, the control group did not follow any regular physical activity program and only did their normal daily activities. Blood pressure, resting heart rate, body weight, cholesterol, triglyceride, LDL and HDL serum levels were evaluated before and after the intervention. Student's t statistical method for dependent and independent groups was also used for intra-group and inter-group comparison of variables, respectively. The results showed that a period of swimming training decreased weight, cholesterol, triglycerides, LDL, resting heart rate and blood pressure, as well as increased HDL in 50-60-year-old men with high blood pressure ( $P < 0.05$ ).

**Keywords:** Hypertension; Cardiovascular Risk Factors; Swimming Training; Elderly Men

### 1. Introduction

Many people in the society in their retirement phase, unfortunately, due to the inappropriateness of some lifestyles such as inactivity and lack of consecutive and appropriate physical activities, improper nutrition, lack of sufficient rest, smoking, etc., which are risk factors for cardiovascular disease and for this reason, in old age, instead of enjoying life

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with family, to solve problems such as blood pressure, diabetes, blood clots, etc., in old age, you have to go to the doctor all the time, and you may end up with long, difficult treatments. They will be loaded and operated. While they can use appropriate sports as a non-medicinal and healthy method to prevent early occurrence or progress and even reduce high risk factors. (1)

Our current world is changing rapidly and the rate of advancement of knowledge and technology is greater than ever before. The replacement of arm power with various types of machines and making things easier is a distinctive feature of the new world, which is very attractive and the result is more comfort and convenience for a person. The result of this scientific and technological progress is the expansion of modernity and urbanization in human society, which can potentially put the most precious gem of human existence, namely health, at serious risk (8).

Urbanization and its associated characteristics such as traffic, air pollution, long journey to the destination (work place or places to get daily necessities), increase in population density, increase in poverty and crime, lack of parks and green spaces in sufficient quantity, lack of sports spaces and cheap and accessible sports services. They are among the factors that increase the lack of mobility in urban communities (2). Proper physical activity and exercise is one of the least expensive ways to maintain health and prevent non-communicable diseases such as blood pressure and cardiovascular diseases, and the fact that proper physical activity can make a person healthy, energetic, and cheerful is the consensus of all experts and Health experts (4).

The high prevalence and close relationship between high blood pressure and cardiovascular diseases has caused high blood pressure to be considered one of the most important and growing public health problems in the world, especially in developing countries (7). The advances that have been made in the diagnosis and treatment of high blood pressure have played an important role in significantly reducing the death caused by coronary heart disease and stroke in developed countries. However, in other countries, the control of high blood pressure in the last few years has led to a decrease in cardiovascular disease (3). The World Health Organization has estimated that in the future, high blood pressure will cause one death out of every eight deaths and will eventually be the third cause of death in the world (6). There are about one billion people with high blood pressure and 4 million people die as a direct result of high blood pressure every year (5).

Complications of high blood pressure are increasing. The findings indicate that 55-year-old people with normal blood pressure have a 90% chance of developing high blood pressure during their lifetime. The higher the blood pressure, the higher the risk of heart attack, heart failure, stroke and kidney disease. In the study of the risk factors of non-communicable diseases in the country in 2018, about 16% of people aged 15 to 64 had high blood pressure (1).

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## 2. Research methods

This semi-experimental research will be conducted with a pre-test and post-test design in two experimental and control groups. First, the variables of the research are described by the indices of tendency to the center (mean) and dispersion (standard deviation) and to present a clearer picture, statistical charts are used. Then, through the statistical method of Student's t for independent groups and Student's t for affiliated groups, the research hypotheses will be tested. The training protocol is aerobic swimming training for 8 weeks for 3 sessions a week, with an intensity of 70% of the maximum heart rate, which lasts 10 minutes in the first week of each session, which will gradually reach 45 minutes in the final week. These exercises include Softening for 5 to 6 minutes to warm up the joints and slow swimming to warm up the body in general, 10 minutes of swimming practice with a minute rest after 5 minutes of practice, where the heart rate is measured to control the pressure with a timer and the practice continues for 5 minutes and at the end 5 minutes of cooling down with slow swimming and stretching movements outside the water in the first session, which will gradually increase in the next training sessions.

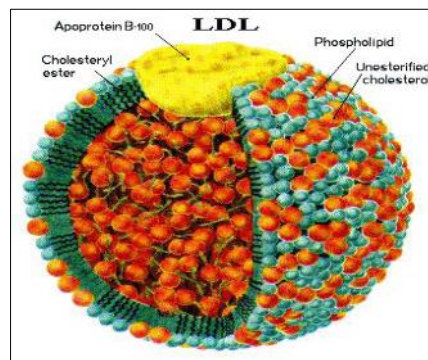
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## 3. Results

The results of this study showed that this semi-experimental research will be conducted with a pre-test and post-test design in two experimental and control groups. First, the variables of the research are described by the indices of tendency to the center (mean) and dispersion (standard deviation) and to present a clearer picture, statistical charts are used. Then, through the statistical method of Student's t for independent groups and Student's t for affiliated groups, the research hypotheses will be tested.

**Table 1** WHO classification of weight based on BMI (26)

Classification	BMI (kg/m <sup>2</sup> )	Risk of comorbidities
Underweight	<18.5	Low (but risk of other clinical problems increased)
Normal range	18.5–24.9	Average
Overweight (preobese)	25.0–29.9	Mildly increased
Obese	≥30.0	
Class I	30.0–34.9	Moderate
Class II	35.0–39.9	Severe
Class III	≥40.0	Very severe



**Figure 1** Compositions of LDL lipoprotein structure

**Table 2** Normality of data distribution using the Shapiro-Wilk test

	The number of exercise sessions	The number of exercise sessions per week	Warm-up time, exercise, gentle swimming (minutes)	Training time in each swimming session at 70% of maximum heart rate	The rest time between the main exercise and taking the heart rate by the timer to control the pressure of the exercises	Cooling down includes gentle swimming and stretching
1	First week	3	5-6	10	1 minute of rest after 5 minutes of exercise	5 minutes
2	Second week	3	5-6	15	1.5 minutes of rest after 7.30 minutes of exercise	5 minutes
3	Third week	3	5-6	20	1 minute of rest after 5 minutes of exercise	5 minutes
4	Fourth week	3	5-6	25	1/5 minutes rest after 6.15 minutes of exercise	5 minutes
5	Fifth week	3	5-6	30	2 minutes rest after 7.15 minutes of exercise	5 minutes
6	Sixth week	3	5-6	35	2 minutes rest after 7 minutes of exercise	5 minutes

7	Seventh week	3	5-6	40	2 minutes rest after 8minutes of exercise	5 minutes
8	Eighth week	3	5-6	45	2 minutes rest after 9 minutes of exercise	5 minutes



**Figure 2** How to take blood pressure

**Table 3** Descriptive characteristics of subjects

Rank	Variable	Measurement scale	SD /mean
1	Age	Year	54/95 ± 3/18
2	Height	Centimeters	174/05 ± 5/18
3	Weight	Kilograms	82/20 ± 5/36
4	Cholesterol	mg/dL	212/40 ± 14/35
5	Triglyceride	mg/dL	305/25 ± 21/81
6	HDL	mg/dL	54/95 ± 4/38
7	LDL	mg/dL	104/05 ± 11/38
8	Heart beat rest	Minutes	76/70 ± 2/10
9	Systolic blood pressure	mmHg	153/80 ± 6/66
10	diastolic blood pressure	mmHg	88/60 ± 4/61
11	Normal blood pressure	mmHg	121/12 ± 4/37

The training protocol is aerobic swimming training for 8 weeks for 3 sessions a week, with an intensity of 70% of the maximum heart rate, which lasts 10 minutes in the first week of each session, which will gradually reach 45 minutes in the final week. These exercises include Softening for 5 to 6 minutes to warm up the joints and slow swimming to warm up the body in general, 10 minutes of swimming practice with a minute rest after 5 minutes of practice, where the heart rate is measured to control the pressure with a timer and the practice continues for 5 minutes and at the end 5 minutes of cooling down with slow swimming and stretching movements outside the water in the first session, which will gradually increase in the next training sessions.

#### 4. Discussion

Endurance swimming training reduces the increase in blood pressure in people who are at high risk of developing hypertension over time, so its use as a non-pharmacological method to reduce high blood pressure in susceptible people is allowed. It seems that it reduces blood pressure to the same amount as more intense exercises or more, especially for certain groups with high blood pressure such as the elderly, it is of special importance (1).

Based on the present findings, it is concluded that a period of swimming training improves the lipid profile and high blood pressure in elderly men with high blood pressure, and since high blood pressure threatens health and heart attacks, swimming training can improve the profile Lipids, which are cardiovascular risk factors, reduced the risk of heart attack in elderly men with high blood pressure.

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#### Compliance with ethical standards

##### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

##### *Statement of informed consent*

Informed consent was obtained from all individual participants included in the study.

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