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THE IMPORTANCE OF MODERATE-INTENSITY AEROBIC SPORTS ACTIVITIES IN LOWERING THE LEVEL OF HIGH BLOOD PRESSURE FOR PATIENTS

Mahour Bacha Mourad[1],
Ferahtia Sabira[2],
Rami Azeddine[3],
Baouche Khaled[4i]
[1,2]Institute of Physical Education and Sports (IEPS), University of Algiers, Algeria
[3]Institute of Science and Techniques of Physical and Sports Activities, University of M'Sila, Algeria
[4]Institute of Science and Techniques of Physical and Sports Activities, University of Bouira, Algeria

Abstract:
The aim of the research was to identify the importance of moderate aerobic sports activities in lowering the level of high blood pressure for patients. The mechanism of regulation of blood pressure, the causes of its height and complications, the identification of blood pressure during physical exertion and rest, the importance of sport for blood pressure patients, After analyzing these elements, it was concluded that:

- Aerobic training has a positive effect on lowering the level of blood pressure, especially systolic pressure.
- Exercising lightly by patients reduces the risk of cardiovascular disease.

The most important recommendations are:

- The need to use moderate-intensity aerobic activities to keep a normal blood pressure.
- The need for the regularity in performing the aerobic exercises and for 3 times per week and gradually increasing the planned period through the weekly units to achieve better results.
- Raising awareness for patients with high blood pressure to the importance of practicing sports and for all the different ages.

Keywords: aerobic sports, blood pressure

[i] Correspondence: email khaled.baouchestaps@yahoo.com

Introduction

Hypertension (high blood pressure) is one of the prominent diseases of this era, which are called "hypokinetic diseases" that result from the modern life and basing on the modern technology in work, that no society is free from this disease, and it is just a rising and increasing problem and we cannot ignore it, which led to the increase of the injuries in this current era because of the circumstances that individuals encounter through their lives, and the tensions of life and society problems which negatively affect the patient's health and psychological situation, prompting individuals to search for means to prevent and treat it.

Due to the lack of the studies that treat this subject basing on the suitable natural means, such as aerobic exercises (oxygenic) and massage that are used in different intensities, and the fact that most patients rely on special drugs of decreasing the pressure due to the easiness of taking them though their negative side effects on the different body systems, which lead to the occurrence of other health problems.

In this sense, the researchers wanted to study the importance of moderate-intensity aerobic sports activities in lowering the level of high blood pressure for patients without the occurrence of any side effects that may increase the intensity of this disease in the future.

Thus, we will focus on the following axes in this scientific paper:

1. Blood pressure and mechanism of its regulation.
2. High blood pressure.
3. Causes of high pressure and complications resulting from it.
4. Blood pressure during physical exertion and during rest.
5. Sport and its importance to patients with blood pressure.
6. Blood pressure and aerobic training.

In the last:

7. General conclusion.
8. Recommendations.

1. Blood pressure and mechanism of its regulation

Blood pressure has a big importance as it is the moving power of the blood inside the periodic system, thus blood circulates from an area of high pressure to another of less pressure. Blood moves from left ventricle when it fills with blood at contraction to the Aorta, despite the elasticity of the aorta walls that is due to the muscular layer, we notice that blood pressure decreases gradually on the artery walls and during the expansion of muscle of the left ventricle, because the elastic walls go back to the original position and press the blood and push it in the arteries and capillaries, so that the pressure moves to the arteries then the ventricle returns to the contraction again which causes very high pressure, (Liznait and Farida Othman, 1999, pp. 22-24)

Pressure happens when the left ventricle shrinks so that the pressure gradually increases which lead to the blockage of the atrial-ventricular valve and the opening of the semicircular valve, which causes the first cardiac sound and the pressure continues to rise in the left ventricle until it reaches 120 mm. when the semicircular valve opens, the left ventricle and aorta become as single vessel, so that the pressure in aorta and the other arteries increases fast and becomes equal to the pressure in the left ventricle (contractive pressure), after the beginning of the expansion in the left ventricle, the pressure starts decreasing till it reaches zero, but when the pressure becomes inside the ventricle without the pressure in the aorta the semicircular valve closes strongly causing the second heart sound, the closing of the semicircular valve prevent the decrease of the pressure in the systematic arteries to zero instead of that it decreases to 80 mm.z '(expansive pressure) (Braund Wald, 1997, vol. 1, pp. 807-810), the main reason in non-decrease of the pressure inside the aorta and the branching arteries from it to zero is due to the elasticity of the capillaries walls, thus when the ventricle shrinks the arteries walls expand a little under the influence of the shrinking power which means that a part of the kinetic energy resulting from contraction transforms to potential energy in the arteries walls, however, in the ventricle expansion the arteries walls return to their original positions, so that the reduction of the pressure in the arteries gradually which is opposite to what happens in the left ventricle where the pressure decreases fast to zero because of expansion.

2. High blood pressure

It means that the increase of the blood pressure in the arteries to a higher level than the normal blood pressure, it is known that every person has blood pressure in order that the metabolism processes continue inside the body, in addition, it is considered one of the diseases that affect the heart system and the circulatory system in the industrial countries. Thus, it occurs as a result of the continuity of the pressure on the arteries walls which relies on the amount of blood pushed from the heart in a minute and the resistance of the blood vessels of the blood stream, that is, the more there is increase in pushed the amount of blood, the more the pressure increases, and the more the blood vessels resistance increases, the more the blood pressure increases. (Folsom AR, Prineas RJ, 1990, p 706-707)

Blood pressure is considered high when the reading of the number is more than (140/80) mm.z, thus if the pressure goes more than that limit, the person will be suffering from high blood pressure, here he needs monitoring and treatment, this disease is one of the main reasons for the heart diseases and arteries and blood clots and may lead to the damage of the internal surface of arteries and their stiffness, as well as it works on the increase of the pressure on long-term periods and this has a relation to kidney failure. (Ayed Fadl Melhem, 1999, p 07). James & Barry (1996) classified high blood pressure rates for systolic and diastolic pressure as follows:

Table 1: The classification of rates of high blood pressure

Classification	Diastolic	Systolic
Normal	<85	<130
More than normal	89-85	139-130
Simple high pressure	99-90	159-140
Medium high pressure	109-100	179-160
Very high pressure	119-110	209-180
Very very high pressure	120 and more	210 and more

2. Reasons of high pressure and it complications

Most of those who complain from high blood pressure do not know the reason behind its increase, this does not mean that there is no reason of it, but the reason may be not clear and the ratio of those reaches (95%) of the people suffering from it, this kind of pressure is called primary high pressure, thus the remaining ratio (5%) of people suffering from it is for known reasons such as the different diseases, this is called secondary high pressure. (Petrlla R. J., 1998, p31)

The reasons behind Primary blood pressure are due to:

- Genetic;
- Environment factors: such as salt, alcoholic drinks, obesity, psychological stress (psychological pressure), and smoking.

The reasons behind Secondary blood pressure are: (Ion Aubrian and Omali, 1987, p 50)

- Kidneys;
- Glands;
- Drugs (medicine).

3. Blood pressure during physical effort and during rest

Since the beginning of the 20th century, doctors and physiologists of physical effort have been concerned about the effect of physical effort and its relation to high blood pressure. The increase in pressure is due to the increase in cardiac output even in the case of decreasing peripheral resistance, which results in widening of the arteries, which causes the reduction in the cardiac output which is considered a crucial factor in this subject, thus, there are many other factors that affect blood pressure during the physical effort which are (age, working muscles strength, level of fitness, smoking, the nature and pattern of the physical effort) (Muhammad Nasreddine Radwan, 1998, p 73) Garth Fisher (1990) reported that pressure increases with increased effort due to an increase in the volume of blood pumped by the heart during exertion. Systolic blood pressure is naturally increasing, as increased diastolic pressure leads to reduced blood volume in the heart. The pulse pressure increases with the effort due to the increased difference between the systolic and diastolic pressures. In the case of increasing the diastolic pressure during the effort, this indicates the irregularity of the effort reaction.

The effort test should be stopped if the diastolic pressure reaches (100) mm.z or more. (Garth Fisher, Clayen R. Jensen, 1990, p 96)

There have been several studies about the effects of the effort on the increase of blood pressure. Niigman and Gibbons (1990) reported that among the reason of suffering from that disease the less practice of sport, thus the benefits of sports lay in reducing the possibility to be affected of this disease, medicines may have benefits in reducing death because of the sufferance from high blood pressure but their effects are very little in cases of light medium blood pressure. (Nichman M.L. Gibbons L.W., 1990, p 39)

Blood pressure significantly increases when performing a physical effort and is not equal in the different areas, thus it increases more when having training on the higher limbs more than the lower limbs, this is due to the volume of beat increases significantly in the first case more than the second case, so it is recommended to take into consideration that those suffering from high blood pressure should not do high effort on the higher limbs which may be dangerous to them. (Ahmed Mohamed Khater and Ali Fahmi Al-Beek, 1996, p 145)

This case is applied also on body position during the performance of physical activities, thus the blood pressure rises when performing the muscular workout in the vertical positioning rather than the horizontal positioning, so that heart pumping volume increases when performing the same muscular workout and at the same level of oxygen consuming when working using the legs from a sitting position or laying down rather than the muscular workout by the arms in vertical position.

The reason behind that is that the muscles mass volume that participates in the muscular workout is more in the legs rather than the arms, thus the capillaries that receive blood in the legs is more in amount than in the arms, thus they receive more amounts of blood, which means the limbs resistance of blood circularity reduces. (Muhammad Hasan Allawi and Ahmad Abdel-Fattah, 2000, p 266)

Muscle exercises with the use of constant muscular contractions increase both systolic and diastolic pressure, but this increase rapidly decreases immediately after exercise. This is what we observe during the mobile muscular workout. The average pressure is directly related to the amount of the heart pumping and, conversely, to the resistance of the limbs blood flow, which the blood pumping process in the capillaries defines, thus the changes in blood pressure during the muscular workout is related to the extent to which the level of heart pumping increasing suit the reduction of resistance of blood circularity. Therefore, the increase of the physical workout leads to the increase in the pressure average but it is not that big. Thus, systolic pressure increases with increased training intensity and the effect of the cardiac pumping on the increase of the systolic pressure is more than its effect on the diastolic pressure. (Muhammad Hasan Allawi and Ahmad Abdel-Fattah, 2000, p 261)

Blood pressure increase during workout, thus it increases forward with the increase of the used maximum oxygen amount and it can reach what is more than (175) mm.z at the increase of workout, then the increase of the blood vessels in the muscles

performing the effort, therefore the reduction of the resistance in the blood vessels due to the circularity of blood in them, and the increase of the pumped blood amount from heart because of the effort is the results of the reduction of the resistance which lead to high pressure and nor its reduction (Ziad Tariq, 2001, p 29), in addition, the resistance may decrease by (3-4) times comparing to its level during rest, and the reduction of the amount of resistance increases as the intensity of the physical effort increases and as long as more muscular group participate in workout, this reduction is as a result of the increase of blood pressure resulting from the increase of the cardiac pumping. (Mohammed Hassan Allawi and Ahmed Abdel-Fattah, 2000, p 264).

The measurement of blood pressure during rest is to know the possibility of the exposure of heart and capillaries to danger and the diseases that may affect human due to his use of effort, so that it is targeted to define the main basic line that it can benefit from in the comparison of the effect of the physical effort and the exercises at the level of blood pressure, as it is used as a jeopardy in the evaluation of the effect of the different patterns of the effort at the level of blood pressure. (Muhammad Nasreddine Radwan, 1998, p 72)

4. Sport and its importance for blood pressure patients

Practice of sports and physical activity in general benefit in the prevention and treatment of many diseases resulting from the lack of movement associated with the development of technology associated with modern civilization, including (high blood pressure), which confirms that is that the surveys showed that the least developed industrial societies are characterized by low prevalence of high pressure compared to societies that are more sophisticated from the industrial side, thus the mobility and the physical activities of person decrease, and sport can lead to positive effects for high blood pressure patients and especially for patients of the first type not associated with dangerous disease complications and also can include the moderate blood pressure patients (140/90) mm.zto (160/95) mm.z concerning the secondary pressure patients, most of those patients undergo to the medical treatment using medical drugs and other means of treatment. (Van Baak, M. A., 1998, p 6-10)

There is also a study showing that well-trained and fitness individuals are not expected to have primary hypertension compared with untrained patients. Studies also indicate that this disease is rare among athletes, with less than (1%) at level of (160/100) mm. In athletes aged 37 years, which is less than the normal rate for non-athletes in this age group, which is usually between 5-10%. (Cade R., al, 1996, p 77- 78)

As for how the body can benefit from the sport in the treatment of high blood pressure, the suggested mechanisms "proposed mechanisms" in this regard deliberately raise many scientific thoughts, the most important reduction of the activity of the symbiotic body when practicing sports, and this therapeutic method is limited in simple cases with sport. (Mr. Jumaili, 1998, p 76)

High blood pressure usually occurs when a person ages, as his arteries and blood vessels begin to lose their elasticity and ability to relax. They cannot absorb the amount of blood flowing from the heart efficiently. Blood finds difficulty in passing through the narrow blood vessels. It gradually increases in limits differ by the difference of the age and the degree of atherosclerosis. (Muhammad Al-Rawi, 2000, p 53). For an athlete, his heart and arteries are constantly trained because they are relatively large enough to carry a large amount of blood flowing to his muscles and body tissues, so his arteries and vessels are more flexible and less susceptible to atherosclerosis. (Ben F. Hurley, James M. Hagberg, 1998, p 89)

The American College of Sports Medicine (1993) issued a medical report on the relationship of sport to high blood pressure, which confirmed that the incidence of high blood pressure is widespread in industrialized countries with diseases of the heart and other circulatory system, with a constant doubt about the effectiveness of drugs used that are anti this disease for cases of the light or medium height. Which called on scientists to search for alternative means of exercise as it proved that aerobic training (endurance exercises) leads to reduce the high pressure for the infected people, and the American College recommended to educate individuals to choose the appropriate type of sports activity they want to do, such as walking, running, biking, swimming, and continuous training in order to improve their physical fitness and avoid participating in high resistance activities. One study showed a significant increase in blood pressure (335/281) mm.z when some individuals during their performance of high weight lifting sport high. (American College of sports Medicine, 1993)

Ziyad Tariq (Bove / 1998) stated that regular exercises are the main axes of the hypertension control program and that normal and regular exercises can be performed weekly to help reduce pressure and reduce the incidence of angina and thrombosis. The best exercises that reduce the pressure level are Aerobic exercise that increases breathing speed and heart rate. (Bove A. and Card. Shermar, 1998, p 1-2)

5. Blood pressure and aerobic training

Several physiological effects occur as a result of sports training, some are directly shown during training, which are called the physiological responses to training. These are "*temporary physiological changes that appear during training and during the period of hospitalization after training and regularity in the training program*" this is what is called adaptation thus the positive benefits appear from the use of a good training program. (Ahmed Abdel-Fattah, 1996, p 30)

Blood pressure is affected during training for patients with high blood pressure as their pressure level is above the normal level during rest, but their increase in pressure increases during training is relative. (Rogers PJ, T. GM, B. KR, al, 1997, p18)

The types of sports activities and programs that are used differ and the most effective in this area: endurance activities (aerobic activities), very low to moderate endurance exercises, but training heavily (50%) of the maximum level of oxygen

consumption leads to lower blood pressure (70%), while high intensity training programs do not have positive effects. (Schwartz R. S. H. VA, 1995, p 19)

In a study conducted by (Norris and Jones) which showed that the possibility of the occurrence of positive effects after around (6-8) weeks, this is due to the decrease of the limbs resistance of the blood vessels that are accompanied by decrease in the levels of plasma norepinephrine hormones, as the study that was performed in laboratories showed that walking trainings and the programs "tread mill" of the mobile belt are very beneficial in the reduction of blood pressure, so that it is worth emphasizing on the moderate aerobic training in order to recover the normal blood pressure, and also other types of programs that will have the big effect in controlling the pressure which are relaxing exercises such as meditation, breathing which has big effects in the reduction of the pressure and the aerobic exercises from sitting and from movement and swimming) all help in the improvement of pressure and its recover to a moderate degree of decreasing. (Norris. P. Jones C. Westn M., 2002, p 10)

In another study conducted previously by Berkov on patients with blood pressure, this study confirms that aerobic exercise and follow the appropriate diet is one of the best preventive and therapeutic means at the same time, as this study confirmed the exercise on a continuous basis and for 30 minutes (3) times per week and moderately help to reduce the level of primary blood pressure and the light rise, as well as aerobic exercises, which are used with a certain intensity for pressure patients do not affect positively on weight. (Berkov R., 1987)

In another study by Carroll, it noted that blood pressure patients who are taking drugs can permanently eliminate or reduce them after regular use of a regular aerobic program. This study confirmed that regular aerobic exercises help improve blood pumping, expand blood vessels, Insulin, and have a positive effect on the re-absorption of water and sodium by the kidney and thus reduce the high pressure. (Carol Kruco F. F., 2000, p 3)

The American Society of Sports Medicine (1993) has determined that the moderate-intensity physical activity (50-75%) from the maximum of heart beats lead to reduction of the level of blood pressure significantly during rest time. (American College of sports Medicine Position stand, 1993, p 25)

In his study, (Hajberg, 1993) found that systolic blood pressure could be reduced by an average of 90 mm and a diastolic 70 mm under the influence of a healthy training program.

Pranon (1992) states that during the effort, systolic pressure increases with increased effort while the level of systolic and diastolic pressure remains at rest and effort when practicing aerobic training. The reason is that aerobic training may lead to a positive change in the smooth muscles of the vessel walls or reduction of pressure may be due to decrease of risk factors during exercise including body fat ratios. (Branon F. J., al, 1992, p 69)

In the case of high intensity endurance exercises, there is an increase in systolic pressure, while diastolic may significantly change in reverse of the performance of the

individual by constant muscular trainings, where both pressure increase, and the experiment proved that the training for (7) weeks and for three times per week improved blood cholesterol and reduced both types of blood pressure. (Bahaa al-Din Salama, 1988, p 196)

6. General conclusion

Through what was mentioned about the effect of aerobic sports activities on blood pressure, we deduce that aerobic training affects positively in the reduction of the level of blood pressure especially the systolic pressure, as well as the test of the moderate appropriate exercises or walking with different speeds that suit the patient state and the practice for no less than (30) min for the single session for (3) days per week are more effective in the reduction of high blood pressure.

It is worth mentioning that aerobic exercises increase the ratio of the harmless cholesterol (HDL) and decrease the harmful cholesterol (LDL) which has big effects on heart diseases and when controlling them, normal blood pressure is kept. Moreover, practicing the exercises lightly by the patients reduces the danger of heart and blood vessels diseases.

7. Recommendations

- The need to use moderate-intensity aerobic activities to keep a normal blood pressure.
- The need for the regularity in performing the aerobic exercises and for 3 times per week and gradually increasing the planned period through the weekly units to achieve better results.
- Raising awareness for patients with high blood pressure to the importance of practicing sports and for all the different ages.

References

1. Ahmed Abdel Fattah. Sports and high blood pressure. Science of Sports Medicine. A specialized scientific journal about the Arab Federation of Sports Medicine. Cairo: Arab Thought House, 1996.
2. Ahmed Mohamed Khater and Ali Fahmy Al-Beek. Measurement in the sports field. I. Cairo: Modern Book House, 1996.
3. Ion Aubrian and Omali Shroud. High blood pressure causes and treatment methods. Beirut: National Company for Publishing and Distribution.
4. Bahaa al-Din Salama. Physiology of sport. Amman, 1988.
5. Ziad Tariq. The effect of regular jogging with or without the weight of high blood pressure. PhD, Faculty of Physical Education, University of Baghdad, 2001.

6. Mr. Jumaili. Medicine and Sports. Cairo: The Book Center for Publishing, 1998.
7. Fadl Melhem. Sports, physiological medicine issues, and contemporary problems. Amman: Yarmouk University Press, 1999
8. Liznait and Farida Osman. Introduction to the Physiology of Sports and Heart Rate Recording. I. Cairo: Dar Al-Qalam, 1999.
9. Mohammed Al-Rawi. Encyclopedia of the human body. I. Amman: Dar Osama for Publishing and Distribution, 2000.
10. Mohamed Hassan Allawi and Ahmed Abdel-Fattah. Physiology of Sports Training. Cairo: Arab Thought House, 2000.
11. Mohamed Nasr El-Din Radwan. Methods of measuring physical effort in sport. Cairo: The Book Center for Publishing, 1998.
12. American College of sports Medicine Position stand. Physical activity, physical fitness & hypertension. Med Sci sports 1993.
13. Ben F. Hurley, James M. Hagberg. "Optimizing Health in older persons: Aerobic & Strength Training" in J Exercise & sport Sciences Reviews. Williams & Wilkins. Vol (26) – U.S.A., 1998.
14. Berkov R. "The Merck manual of Diagnosis & therapy, Rehway", NJMerock sharp & Dohme Research Laboratory, 1987.
15. Bove A. and Card. Shermar. "Low-pressure Workouts for Hypertension". Journal of physical & sports Medicine, Vol. 26, no. 4, April 1998.
16. Branon F J, al. "Blood pressure changes" in "Cardiopulmonary Rehabilitation". F. A. Davis (Company pub, U.S.A 1992.
17. Braund Wald. E: Heart Disease: A text book of cardio vascular Medicine, ed. 5. Philadelphia, WP. S. Co, 1997.
18. Cade R, al. "Effect of Aerobic Exercise Training on patients with Systemic Arterial hypertension". American Journal of Medicine, 1996.
19. Folsom AR, Prineas RJ; K.SA, et al. Incidence of hypertension & stroke in relation to body fat distribution & other risk factors in older women, Storke, 1990.
20. Garth Fisher, Clayen R. Jensen. Blood pressure during work, in book. "Athletic conditioning", Lea & Febiger Pub, U.S.A., 1990.
21. Nichman M.L. Gibbons L.W. The Effect of Exercise on high blood pressure, J. Vol. 22, No.2, Denmark, 1990, Section – 2. Symposium.
22. Petrlla RJ. How effective is exercise training for the treatment of hypertension. Clin J. sport medicine 8(3):224-31, 1998.
23. Rogers PJ, T. GM, B. KR, et al. "Exercise – induced increases in atrial. natriuretic Factor are attenuated by endurance training". J AM. COLL Cardiol, 1997.
24. Schwartz R. S. H. VA. "The effects of endurance & resistance training on blood pressure". In J obes Relat Metab Disord, 1995.
25. Van Baak. M. A. "Exercise & Hypertension: Facts & uncertainties. Br J sports Medicine, 32(1); 1998.