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The Effects of Aerobic Training on Physical Performance in Subjects with Cardiac Diseases

on Adapted Physical Activity and Health

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DEDICATE

TAHA:

I give this work to my parents and my big family, and my teacher

Pr. Khelifa Said Aissa, and my university family.

SAHRAOUI:

First and foremost, we thank God ALLAH, the Almighty who continues to protect us. thank you, lord, for granting us enough patience and endurance to accomplish this dissertation I'd like to seize this opportunity to pay tribute to my father dearest may he rest in peace We dedicate this dissertation to our mothers. We want to take this opportunity to thank you and recognize Throughout our life you have always been there for us. You never stopped praying for us during out academic career and encouraged us regularly every step of the way, and to our brothers and sisters all our family, for inexhaustible affection, and their precious pieces of advice, we would also like to thank SAID AISSA KHELIFA, our supervisor for their kindness and generosity. It was a pleasure working with you Finally, I would like to thank everyone, directly or indirectly, has contributed to the success of our academic career and the development of this thesis.

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To my colleague Issa Halima, for the time, guidance and valuable advice she has continued to provide me until the end of this research.

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I am grateful for your support, and thank you all.

Sahraoui

We express our sincere thanks to all those who contributed directly to the completion of this study, to our Pr. SAID AISSA KHELIFA for the time, guidance and valuable advice that he never stopped giving us in order to reach the end of this research Without forgetting to thank in particular all the patients who agreed to carry out this study and respond to the questionnaire.

Thank you all

Abstract:

Heart disease remains the main cause of morbidity and mortality in the world, for this reason several studies have demonstrated the effectiveness of physical training on heart disease after a cardiac event, physical activity, at this level, is one of the essential determinants of good health.

The objective of our work is to know the effect of cardiac rehabilitation to exercise on the physical, clinical and psychological aspect in the effects of aerobic training on physical performance in subjects with cardiac diseases, to become aware of the physiological and psychological potential of the targeted population as well as to provide elements useful information on the level of physiological adaptation of the body of cardiac diseases patients to exercise in cardiac rehabilitation.

This is a retrospective and prospective study carried out in EHS - Specialized Hospital Establishment Dr Maouche Mohand Amokrane.

centers and covering the files of patients who came for reasons of cardiac diseases and with the aim of following a cardiac rehabilitation program, this study concerned 65 patients from the CNMS.

In relation to the main hypothesis, the present study, having treated the evolution of certain cardiac diseases patients before and after an exercise cardiac rehabilitation program and the parameters of two exercises tests, allowed us to put certain reference standards for the control and evaluation of the level of physiological adaptation of the body to the effect.

Cardiac exercise rehabilitation has a significant impact on physical reconditioning in cardiac diseases patients and a very positive psychological impact.

الملخص بالعربية

تظل أمراض القلب السبب الرئيسي للوفيات في العالم، من أجل هذا السبب أثبتت العديد من الدراسات فعالية التدريب البدني على أمراض القلب بعد حدث قلبي، ويعتبر النشاط البدني على هذا المستوى هو أحد المحددات الأساسية للصحة الجيدة.

الهدف من عملنا هو معرفة تأثير إعادة تأهيل القلب على ممارسة الرياضة على الجانب البدني والسريري والنفسي في آثار التدريب الهوائية على الأداء البدني في المواضيع مع أمراض القلب، لتصبح على بينة من الإمكانات الفسيولوجية والنفسية للمرضى المستهدفين وكذلك توفير عناصر معلومات مفيدة عن مستوى التكيف الفسيولوجي للجسم من مرضى أمراض القلب والممارسة في إعادة تأهيل القلب.

هذه الدراسة تم اجرائها في مؤسسة المستشفى التخصصي دكتور معوش مهند أمقران. وتم تغطية ملفات المرضى الذين جاءوا لأسباب تتعلق بأمراض القلب ويهدف متابعة برنامج إعادة تأهيل القلب. وشملت هذه الدراسة 65 مريضا من CNMS.

فيما يتعلق بالفرضية الرئيسية، فإن الدراسة الحالية، بعد أن عالجت تطور بعض مرضى أمراض القلب قبل وبعد برنامج إعادة تأهيل القلب بالتمارين، سمحت لنا بوضع معايير مرجعية معينة لمراقبة وتقييم مستوى التكيف الفسيولوجي للجسم.

إن إعادة التأهيل بالتمارين القلبية لها تأثير كبير على إعادة التأهيل البدني لدى مرضى القلب ولها تأثير نفسي إيجابي للغاية.

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STUDY INTRODUCTION

INTRODUCTION:

Heart disease represents a significant global health burden, affecting individuals, families, and healthcare systems worldwide. The World Health Organization (WHO) reports that cardiovascular diseases are the leading cause of death globally, resulting in approximately 17.9 million deaths annually. Socioeconomic factors play a critical role in the prevalence and outcomes of heart disease, contributing to the economic burden through healthcare costs, loss of productivity due to morbidity, and the economic impact of premature deaths.

Heart diseases, including coronary artery disease, heart failure, arrhythmias, and valve disorders, remain major causes of morbidity and mortality worldwide. Despite significant advances in medical science, a complex interplay of genetic, environmental, and lifestyle factors contributes to the continued prevalence of heart disease. Key contributors to heart disease include genetic predisposition and acquired risk factors such as obesity, high blood pressure, diabetes, and smoking.

The WHO defines physical activity as any bodily movement produced by skeletal muscles that requires energy expenditure. This encompasses movements performed during leisure time, at the workplace, or while moving from one place to another.

Moderate or sustained physical activity has numerous health benefits, including the prevention and management of no communicable diseases such as heart disease, stroke, diabetes, and several cancers. Physical activity also helps prevent hypertension, maintain a healthy body weight, and improve mental health, quality of life, and well-being (World Health Organization, 2022).

Physical activity provides many benefits for the heart and arteries, even in individuals with heart disease. After a heart operation, myocardial infarction, or in the presence of chronic heart disease, cardiac rehabilitation is strongly recommended. This personalized program aims to prevent the worsening of heart disease, aid recovery after surgery, and reduce the risk of future cardiovascular events. Some specialized establishments offer patients the possibility of staying for several weeks to recover, benefit from close medical monitoring, and learn to live with heart disease through

advice on diet, physical activity, and general lifestyle. While a stay in a cardiac rehabilitation facility is not compulsory, many heart patients prefer to return home directly after an operation or myocardial infarction. However, participation in such programs is essential for recovery, maintaining an efficient cardiovascular system, and preventing new heart problems (Fédération Française de Cardiologie, 2021).

Research Problem

Despite the known benefits of physical activity, the specific impact of aerobic training on physical performance in people with heart disease remains an area requiring further investigation. This study aims to address the following research question:

How does aerobic training affect physical performance in people with heart disease?

Understanding the effects of aerobic training on this population is crucial for developing effective rehabilitation programs and improving the overall health and quality of life for individuals with heart disease.

- **Research Question**

How does aerobic training affect physical performance in individuals with heart disease?

Hypothesis

Aerobic training will significantly improve the physical performance and cardiovascular health of individuals with heart disease compared to those who do not participate in regular aerobic exercise.

The importance of the study

The importance of the topic is Crystallized in several points the most, The most important of which we will mention:

- A new addition to studies dealing with the same topic.
- The current study is within the researcher's knowledge.
- Through the results of this study, it's expected to identify the relationship between Cardiac Diseases and Aerobic Training.

Objectives

Primary Objective:

- To assess the impact of aerobic training on the physical performance of individuals with heart disease.

Secondary Objectives

- To evaluate changes in cardiovascular health markers, such as blood pressure, and heart rate, following a period of aerobic training.

- To measure improvements in exercise capacity and endurance in heart disease patients who engage in aerobic training.

- To compare the incidence of adverse cardiac events between patients participating in aerobic training and those who do not.

Key words

- **Idiomatic definition of physical performance:**

It referrers to an athlete ability to demonstrate proficiency and skill in a particular sport, considering various factors, overall physical fitness, technical abilities, mental resilience, tactical understanding. (Oxford Dictionary)

- **Procedural definition of physical performance:**

Is an individual ability to carry out various tasks related to movement, coordination and fitness and procedural memory implicit memory, brain regions involved cardiovascular system and heart diseases.

- **Idiomatic definition of cardiac diseases:**

Are referring to a group of disorders that affect the heart and blood vessels, idiopathic heart conditions, atherosclerosis. (World Health Organization, 2022)

- **Procedural definition of cardiac diseases:**

Are the group of disorders affecting the heart and blood vessels and include coronary heart disease, cerebrovascular disease, peripheral arterial disease, leading a healthy lifestyle can significantly reduce the risk of developing cardiac diseases.

Similar studies:

Study (1): The effect of cardiovascular exercise rehabilitation on the physical, clinical and psychological aspect in coronary patients.(2016) **Dr. SAID AISSA Samira**

Problem: "What is the impact of exercise cardiac rehabilitation on the physical, clinical and psychological aspect in coronary patients?"

The objective of the research:

• The ability to reintegrate into a professional environment and autonomy in daily life.

• Improving quality of life and regaining self-confidence by combating stress, anxiety and depression.

The sample: 177 patients• **Age:** on average 59 years• **Gender:** men and women• **Types of pathologies:** coronary patients. **Research method:** a retrospective study **Means:** Questionnaire, follow-up of patients.

Conclusion of the research: Cardiac exercise rehabilitation has a significant impact on physical reconditioning in coronary patients and a very positive psychological impact.

Study (2): the effects of aerobic retraining on improving physical performance indices in cardiac rehabilitation for coronary patients

Dr. Said Aissa Samira (2014)

The objective: was to evaluate the effectiveness of cardiac rehabilitation in enhancing physical capacity, reducing risk factors, and positively impacting patient morbidity and mortality.

Methodology:

The objective was to evaluate the effectiveness of cardiac rehabilitation in enhancing physical capacity, reducing risk factors, and positively impacting patient morbidity and mortality. This retrospective study included 158 patients (148 men aged 45-76 and 10 women aged 56-78) from the “Dr Maouche” hospital in Algiers. The patients, who had undergone either bypass surgery (98 patients), stenting (45 patients), or medical treatment (15 patients), were assessed four weeks post-operation or intervention. Comprehensive evaluations by cardiologists included interviews, clinical

examinations, electrocardiograms, echocardiography, and stress tests to determine risk levels and tailor physical exercises accordingly.

Results:

The results showed that 100% of patients experienced improved maximal physical capacity and reduced symptoms by the end of the program. Additionally, medically treated patients showed a decrease in the ischemic threshold. Psychologically and socially, all patients reported improved quality of life, regained autonomy, reduced anxiety, depression, and stress, cessation of sleeping pill use, increased self-confidence and sexual activity. Furthermore, 85% of patients returned to their usual activities, and 80% returned to professional work, often earlier than anticipated, with an average return-to work duration of 105 days.

Study (3): The Effect of a Cardiac Rehabilitation Program on Cardiac Function Efficacy in Adult Patients Post-Acute Myocardial Infarction (8/31/2017)

Authors: Dr. Mazen Haidar**; Dr. Basem M**arouf**; B**ushra Saleh

Objective: To investigate the impact of a cardiac rehabilitation program on cardiac function efficacy in adult patients following acute myocardial infarction.

Methodology:

The true experimental study included 30 patients aged 18-60 who recently experienced an acute myocardial infarction. These patients were randomly assigned to either an experimental group, which received a cardiac rehabilitation program and a reference booklet, or a control group, which received routine medical care. The research utilized demographic and vital data forms, cardiac function status forms, and a fatigue scale using the PROMIS short-term fatigue scale.

Results:

Results indicated significant improvements in cardiac functional efficacy in the experimental group at the first, second-, and third-months post-rehabilitation, demonstrating the program's effectiveness. Additionally, the experimental group exhibited significantly lower fatigue levels at these same intervals, further highlighting the program's efficacy.

Comment on previous and similar studies:

It's clear through the presenting these studies that focused on rehabilitating the heart and improving physical performance, the most Important of these studies can be highlighted in the following points:

- Determine the topic and propose of the current study.
- Determine the appropriate approach to the topic of the current and study.
- Determine the sample, it's selection method, and it's size.
- Determine the content of appropriate and applicable tools foor this category.
- Determine appropriate tools for collecting data.
- Determine The most appropriate statistical treatment commensurate with the nature of the hypothesis and objectives of the study.

CHAPTER 1:
BIBLIOGRAPHY ANALYSIS

1/Reminder of cardiovascular physiology

1.1/ cardiovascular system

The cardiovascular system is a vast network of organs and vessels that is responsible for the flow of blood, nutrients, hormones, oxygen and other gases to and from cells. (الزهرة و لعرج، 2021-2022)

The human cardiovascular system is a closed loop in which blood circulates in all tissues. Blood circulation requires the action of a muscular pump, the heart which creates the pressure necessary to pulse the blood throughout the body, the Blood passes from the heart to the arteries and returns to the heart through the veins at the level of the greater circulation. (Dr. Samira, 2015-2016)

1.1.1/ Components of the cardiovascular system

1.1.2/The Heart

The heart is considered the most important organ of the circulatory system, and it works as a pump that brings blood to it from all parts of the body in order to push it through the blood vessels again, by contracting and relaxing them, Alternately, depending on the body's need and the intensity of the effort expended

The heart weighs about 300 grams in a man and about 250 grams in women, it is covered by a thin membrane called the pericardium, and there is fluid between this membrane and the heart that facilitates movement.(الزهرة و لعرج، 2021-2022)

The heart is located inside the lower mediastinum, the central cavity of the bony thorax, and is bordered laterally by the lungs. (Marieb)

The human heart is located within thoracic cavity, medially between the lungs in space known as the mediastinum. **Figure1** shows the position of the heart with in the thoracic cavity. With in the mediastinum, the heart is separated from the other mediastinal structures by a though membrane known as the pericardium, or pericardial sac, and sits in its own space called the pericardial cavity. (Marieb)

1.1.2.1/ the different envelopes of the heart

The heart is covered in a double-walled bag called pericardium

- The myocardium
- The endocardium
- The pericardium

1.1.2.1.1/ The myocardium:

The heart muscle is called myocardium. The thickness of the myocardium varies depending on the force that each chamber must develop. It is the left ventricle which constitutes the most powerful cavity. It is therefore at this level that the thickness of the muscular wall is greatest. By contracting, the left ventricle must be able to eject blood throughout the systemic circulatory system. In a sitting or standing position, he must also overcome the force opposed by gravity which attracts the blood towards the lower territories. (H. Wilmore, L. Costill, & Kenney, 2009, pp. 124-125)

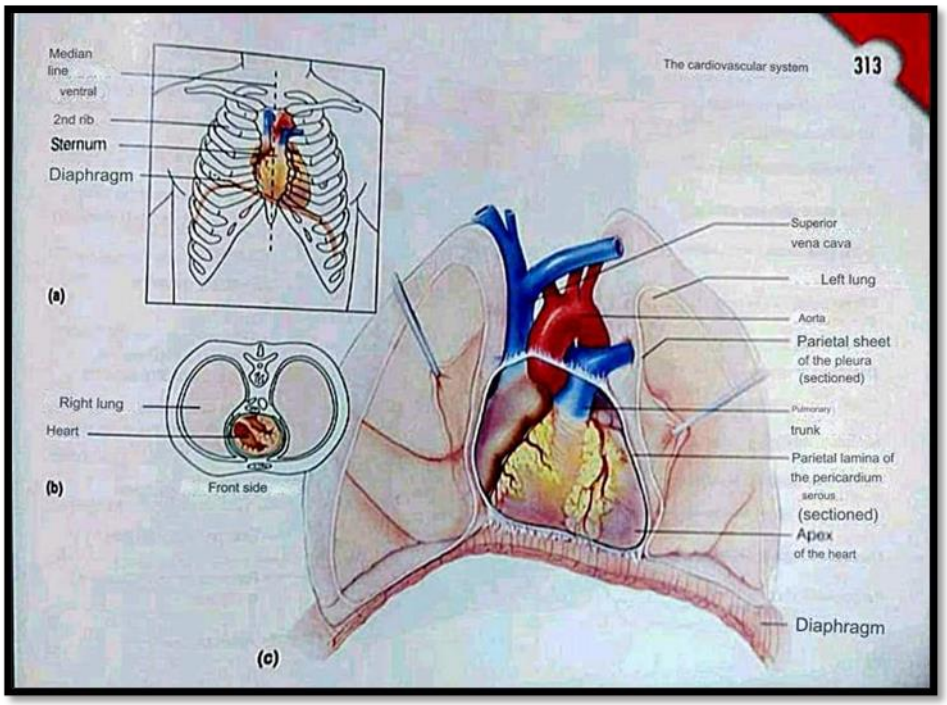


Figure1: location of the heart thorax

1.1.2.2/ The chambers of the heart:

The heart contains four chambers: two atria, or atriums, and two ventricles. Each of these cavities is lined with an endocardium which allows blood to circulate easily through the heart.

The auricles are the upper cavities and serve mainly as entrance cavities. They contribute little to the pumping action of the heart. The blood arriving from the veins enters the atria at low pressure and continues its path towards the ventricles.

The ventricles, whose wall is thick, are the lower cavities; they serve as exit cavities and constitute the actual pumps of the heart. By contracting, the ventricles project blood out of the heart, into the vessels.

The right ventricle forms most of its anterior surface, while the left ventricle forms the apex. The partition that separates the interior of the heart longitudinally is called the interventricular septum or interatrial (or interatrial) septum, depending on the cavities it separates. (Marieb)

1.1.2.3/ Heart valves:

Blood flows in one direction in the heart: it passes from the atria to the ventricles, then it enters the large arteries that emerge from the upper part of the heart. Four valves, which open and close in response to variations in blood pressure exerted on their surfaces, ensure the immutability of this path **Figure2.** (MARIEB, 2005, p. 704)

1.1.2.3.1/ The atrioventricular valves:

- **Tricuspid valve:**

From the right atrium, blood will flow through the right atrioventricular (AV)valve, or tricuspid valve, into the right ventricle. The tricuspid valve is made of three flaps (or cusps) of endocardium reinforced with connective tissue. The general purpose of all valves in the circulatory system is to prevent backflow of blood. As the ventricle contracts, blood is forced behind the three valve flaps, forcing them upward and together to close the valve. (MARIEB, 2005, p. 705)

- **Mitral valve:**

The left atrium receives blood from the lungs, by way of foor pulmonary veins. This blood will then flow into the left ventricle through the left atrioventricular (AV)valve also called the mitral valve or bicuspid (two flaps) valve. The mitral valve prevents backflow of blood from the left ventricle contracts. (MARIEB, 2005, p. 705)

1.1.2.3.2/ The valves of the aorta and pulmonary trunk:

The valves of the aorta and pulmonary trunk are located at the base of the aorta and pulmonary trunk, respectively, and they prevent blood from flowing back into the ventricles. Each of these valves is made up of three semi-lunar valves in the shape of a pocket or crescent. Their operation differs from that of the atrioventricular valves. When the ventricles contract, the intraventricular pressure exceeds the pressure in the aorta and the pulmonary trunk. As a result, the valves of the pulmonary trunk and the aorta open and the passage of blood flattens the valves against their walls. (MARIEB, 2005, p. 705)

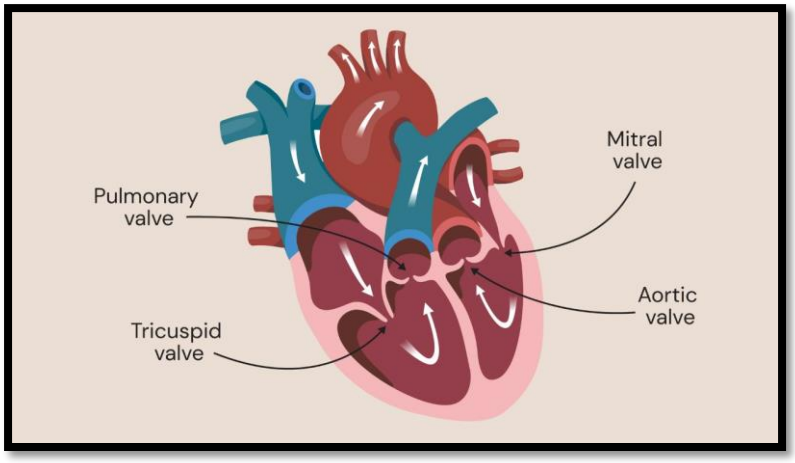


Figure2:
The heart has 4 valves; pulmonary valve, mitral valve, tricuspid valve, and aortic valve.

1.1.2.4/ Blood vessels:

Blood vessels circulate blood throughout your body. They help deliver oxygen to vital organs and tissues, and also remove waste products. Blood vessels include veins, arteries and capillaries. (Dr. Samira, 2015-2016)

1.1.2.4.1/ Arteries:

Arteries are tubes that carry oxygen-rich blood to tissues under high pressure. They are made up of connective tissue and smooth muscle. the walls of these vessels are so thick that no gas exchange is possible between the arterial blood and the surrounding tissues.

The arterial system has three functions: circulatory, transfer of oxygen to the tissues and sending nutrients from the heart to the peripheral system, it is subjected to high pressure the arterial walls have three layers and three stretchable and smooth collagen fibers. In the arteries, there is a strong resistance which causes blood pressure. In the arteries the tension is the same in the vessels as in the small ones. (Dr. Samira, 2015-2016)

1.1.2.4.2/ Capillaries:

These tiny blood vessels have thin walls. Oxygen and nutrients from the blood can move through the walls and get into organs and tissues. The capillaries also take waste products away from your tissues. Capillaries are where oxygen and nutrients are exchanged for carbon dioxide and waste. (clinic, 2021) **(see Figure 3)**

1.1.2.4.3/ Venules:

Veins begin as tiny vessels called venules and get gradually larger as they near your heart. Venules receive blood from capillaries. (clinic, 2021) **(see Figure 3)**

1.1.2.4.4/ Veins:

Unlike arteries, veins don't have to carry highly pressurized blood, but they do have to carry large volumes of deoxygenated blood back to your heart. Thin, less elastic walls help them handle high volumes and low pressure. Most veins have valves that open and close. The valves control blood flow and keep your blood flowing in one direction. (clinic, 2021)

1.1.3/ The Blood:

The third constituent of the cardiovascular system is the circulating medium and the medium circulating in humans is blood and lymph.

It is the living, liquid element, circulating in the circulatory system and irrigating all the tissues of the body. the body, to which it provides nutrients and oxygen necessary for metabolism and from which it collects waste to take it to the organs which eliminate it (kidneys, lungs, etc.)

Blood is in fact involved in the regulation of numerous physiological functions, three of which are of essential importance to exercise, these are transport, regulation of temperature and acid-base balance (pH). The role of blood transport is well known, but it also intervenes in the regulation of temperature during exercise, it allows the transfer of heat from central core or regions of high metabolic activity towards the rest of the body. In the conditions normal and towards the skin if the heat production is really excessive, the blood can also transport the acids produced by anaerobic metabolism ensuring the maintenance of the PH at the level optimal. (Dr. Samira, 2015-2016, pp. 36-37)

1.1.3.1/ Blood circulation:

Blood circulation networks constitute a complex and vital system in the human body. They include the pulmonary circulatory system and the systemic circulatory system. The pulmonary circulatory system carries blood from the heart to the lungs for oxygenation, then returns it to the heart. In contrast, the systemic circulatory

system distributes oxygenated blood and essential nutrients to all parts of the body, while collecting metabolic wastes for elimination. These networks are made up of blood vessels, including arteries, veins and capillaries, which carry blood throughout the body, regulating blood pressure, body temperature and fluid balance. (Marieb, p. 390)

1.1.3.2/ Polmonary circulation:

Even though the heart is a single organ, it functions as a double pump. The right side of the heart is the pump of pulmonary circulation. It receives relatively oxygen-poor blood from the body's veins via the superior and inferior vena cava and ejects it into the pulmonary trunk. The pulmonary artery is divided into two parts, the right and left pulmonary arteries, which carry blood towards the lungs where the latter gets rid of its carbon dioxide and absorbs oxygen. Oxygen-rich blood leaves the lungs and returns to the left side of the heart via the four pulmonary veins. This circulation, which starts from the right side of the heart, enters the lungs and returns to the left side of the heart. **(see Figure 3)**

towards the lungs where the latter gets rid of its carbon dioxide and absorbs oxygen. Oxygen-rich blood leaves the lungs and returns to the left side of the heart via the four pulmonary veins. This circulation, which starts from the right side of the heart, enters the lungs and returns to the left side of the heart. (Marieb, p. 390)

1.1.3.3/ Sestemic circulation:

The blood that has returned to the left side of the heart is then expelled towards the aorta. From there, systemic arteries transport it to tissues throughout the body. Oxygen-poor blood travels from the tissues to the right atrium through the systemic veins, which empty into either the superior vena cava or the inferior vena cava. This other circuit, which starts from the left side of the heart, irrigates the tissues and returns to the right side of the heart, is called systemic circulation

(see Figure 3). It supplies all organs of the body with blood rich in oxygen and nutrients. Since the left ventricle is a systemic pump that propels blood a much greater distance, its walls are between two and three times thicker than those of the right ventricle. (Marieb, p. 390)

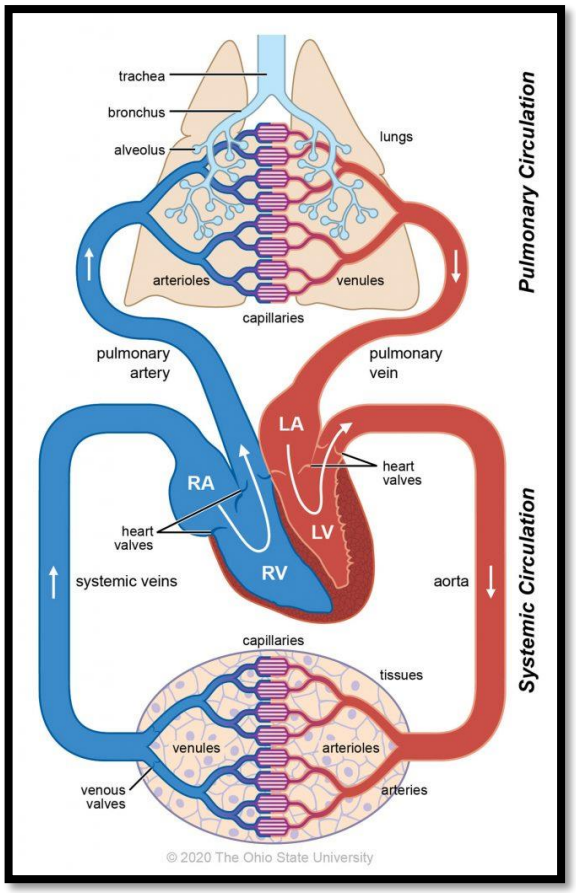


Figure 3: pulmonary circulation and systemic circulation.

1.1.3.4/ Coronary circulation:

The blood that circulates in the heart chambers cannot nourish all the cells that form the wall of the heart due in particular to the thickness of the myocardium. This is why the heart has its own vascular system called the coronary circulation. The right and left coronary arteries arise from the aorta and encircle the heart. The coronary arteries provide an intermittent supply of blood to the heart. Indeed, blood circulates in the coronary arteries when they are relaxed but can no longer circulate when they contract for several reasons: the entrance to the coronaries is partly obstructed by the valve of the aorta which is opened at the same time and the coronary arteries find themselves compressed by the contracting heart. This helps protect the coronaries from damage linked to the high pressures recorded during ventricular systole. (H. Wilmore, L. Costill, & Kenney, 2009, p. 131)

1.1.4/ Heart rate

Heart rate (HR) is one of the easiest cardiovascular parameters to measure. Simply take the pulse at the level of the radial artery or at the level of the carotid artery. Heart rate reflects the work that must be done by the heart to meet the increased demands imposed by exercise. To see this, simply compare resting and exercise heart rates. (H. Wilmore, L. Costill, & Kenney, 2009, pp. 158-159)

1.1.4.1/ Resting heart rat

Resting heart rate is approximately 60 to 80 bpm. In middle-aged and totally inactive subjects, it can reach 100 bpm. In very endurance athletes, values of 28 to 40 bpm have been reported. In general, resting heart rate decreases with age. It can also vary with environmental conditions. This is how it increases with ambient temperature and altitude. Often it increases even before the exercise begins. This is an anticipated response linked to the release of a neurotransmitter, noradrenaline, by the sympathetic nervous system, and of a hormone, adrenaline, by the adrenal medulla. Conversely, any vagal stimulation (of emotional origin) reduces it. To determine the resting heart rate as precisely as possible, it should therefore be measured in conditions of total relaxation, that is to say first thing in the morning upon waking up. Heart rate values measured before exercise cannot reflect resting heart rate. (H. Wilmore, L. Costill, & Kenney, 2009, pp. 158-159)

1.1.4.2/ Exercise heart rate

During exercise, heart rate increases rapidly in proportion to intensity.

It is possible to estimate it from age because the maximum heart rate decreases slightly with age by approximately one beat per year. For a given age, it is estimated on average at 220, the age expressed in years. This is only an approximation around which individual actual values may vary widely. At 40 years old for example, the maximum heart rate estimated from the previous formula (HR max = 220-40) is 180 bpm. Statistical studies show that at this age 68% of individuals have a maximum heart rate between 168 and 192 bpm ± 1 standard error, and 95% between 156 and

204 bpm ± 2 standard errors. This underlines the margin of error of the prediction formula. A more recent equation has been developed to estimate HR max from age. This equation, intended particularly for those under 20 and over 50, appears more appropriate in this equation, Fc max = 208 - (0.7 x age in years).

(H. Wilmore, L. Costill, & Kenney, 2009, pp. 158-159)

1.1.5/ High blood pressure

It is assumed and known that every human being has blood pressure, otherwise he loses the ability to continue metabolic processes within the body, thus making life impossible.

Blood pressure is simply the pressure created during the rush of blood against the inner walls of the arteries. This pressure is measured using a special measuring device that records the pressure in millimeters of mercury (mm Hg), and the blood pressure reading is given by two numbers: 80/120 mm Hg, where the high number (120) represents systolic blood pressure - that is, the contraction of the heart pushing blood through the arteries and the number Low (80) diastolic blood pressure.

(ملحم، 2011، صفحة 7)

1.2/ cardiac physiopathology:

Cardiovascular disease is a disease or injury affecting the heart, the blood vessels supplying the heart, or the network of blood vessels (arteries and veins) throughout the body and within the brain.

1.2.1/ Myocardial infarction:

Myocardial infarction, or heart attack, corresponds to the destruction of part of the heart muscle, when it is no longer sufficiently supplied with oxygen. This happens when an artery that irrigates it becomes blocked or suddenly decreases in diameter. This happens, for example, when a fragment of fatty plaque detaches from the

internal wall of a blood vessel and blocks an artery in the heart. A blood clot then forms, which causes part of the heart to suffocate.

Myocardial cells deprived of oxygen die and the area concerned, more or less extensive, is no longer able to contract properly. (Infarctus du myocarde, 2024)

1.2.2/ High blood pressure:

Blood pressure is the measure of the force of blood pushing against blood vessel walls. The heart pumps blood into blood vessels, which carry the blood throughout the body.

High blood pressure, also called hypertension, means your heart is working harder to pump blood out to the body. It's a dangerous condition and contributes to hardening of the arteries, or atherosclerosis, stroke, kidney disease, and heart failure. (Mitchell & Altomara, 2023)

1.2.3/ Valvulopathies:

Heart valve disease – valvulopathy – occurs when the valves of the heart become diseased or damaged, affecting the blood flow through the body and putting extra strain on the heart. There are 2 main types of valvular heart disease:

- **Valve stenosis**

  This occurs when the valve becomes narrowed or doesn't open properly, restricting blood flow through the valve. (Guys and St Thomas Specialist Care, n.d.)

- **Valve regurgitation**

  This occurs when the valve does not close in a normal way, causing the blood to flow backwards or leak through the valve. This condition is also known as (valve incompetence), or (leaky valve). If it the mitral valve is affected, this is called mitral regurgitation. (Guys and St Thomas Specialist Care, n.d.)

1.2.4/ Angina Pectoris:

Angina pectoris is the medical term for chest pain or discomfort due to coronary heart disease. It occurs when the heart muscle doesn't get as much blood as it needs. This usually happens because one or more of the heart's arteries is narrowed or blocked, also called ischemia.

Angina usually causes uncomfortable pressure, fullness, squeezing or pain in the center of the chest. You may also feel the discomfort in your neck, jaw, shoulder, back or arm. (American Heart Association editorial staff and reviewed by science and medicine advisors., 2022)

1.2.5/ Atherosclerosis:

Atherosclerosis is a disease affecting the arterial blood vessel. It is commonly referred to as a "hardening" or"furring" of the arteries. It is caused by the formation of multiple plaques within the arteries.

Arteriosclerosis ("hardening of the artery") results from a deposition of tough, rigid collagen inside the vessel wall and around the atheroma. This increases the stiffness, decreases the elasticity of the artery wall. Atherosclerosis typically begins in early adolescence, is usually found in most major arteries, and yet is asymptomatic and not detected by most diagnostic methods during life. It most commonly becomes seriously symptomatic when interfering with the coronary circulation supplying the heart or cerebral circulation supplying the brain, and is considered the most important underlying cause of strokes, heart attacks, various heart diseases including congestive heart failure and most cardiovascular diseases in general. (Adrignola, AmWengert, Bfatafehi, & and all)

1.3 / PHYSICAL EXERCISE AND PERFORMANCE INDEX

1.3.1/ Notion of physiology

The physiology of sport was born in the last century with the work that Étiennes. Jules Marey devoted to the study of movement with his collaborator Georges Demen in the name of initiator of the graphic method were added those of Paul Sert, Jean. Baptiste Chauveau and Charles Richet. Closer to us appeared the personality of Paul Chaill and Bert (grandson of Paul Bort), student of Langlois, who in 1924 was responsible for a course in physiology applied to physical education and founded in 1927 the Physical Institute of University of Paris.

1.3.1.1/ The physiological of physical activity

1.3.1.1.1 / Energy metabolism

Bioenergetics data have highlighted the fact that every living being is an energy producer and, more precisely, an energy transformer. Indeed, thanks to its relational functions (motor skills, exteroceptive sensitivity), the individual takes, from the external environment, materials carrying chemical potential energy, food and the oxygen necessary for reactions allowing the release of this energy. It then rejects, outside, the waste resulting from the various food processing operations. Ensured by our major functions (digestion, excretion, circulation, respiration), this energy metabolism will be a producer of energy (chemical, thermal, mechanical), but also a consumer of energy (basic metabolism)10 Food therefore appears to be the essential element for the functioning of the organism and, therefore, for life. Also, in order to meet the requirements of their different modes of operation, the individual must constantly have a diet adapted, both qualitatively and quantitatively, to their energy expenditure (food rations). (M, 1986)

1.3.1.1.2/ Energy expenditure

The mere fact of existing requiring energy, there is a basic energy production, called basic metabolism, linked to the life of the cells of the devices ensuring the major functions (circulation, respiration, excretion, digestion) and the Muscle tone.

The value of the basic metabolism being proportional to the surface area of the body (in m2 and per hour), it is often related to a period of 24 hours. Thus, depending on the expression chosen, the basal metabolism will be, in humans, 39 kcal/m2/h or 1600 kcal/24 h; in women, 34 kcal/m2/h or 1300 kcal/24 h.)APFELBAUM. C. M ‹ (1989

1.3.1.1.3/ Muscle contraction and energy sources

1.3.1.1.3.1 / Energy sectors

At the origin of physical activity is “the muscular engine”. It is the needs of the latter that the cardiovascular system must cover through adequate adaptation. This muscular engine essentially has three energy sources or sectors, unequal in their possibilities and their conditions of use. An energy source is defined by its power, that is to say the extent of available energy reserves. In other words, power expresses peak energy and capacity, the duration during which the energy source can provide the muscular motor with the elements it needs. (CHIGNON, 1984, p. 02)

1.3.1.1.3.1.1/ The anaerobic a lactic sector: ATP and PC

The body finds its first energy source in the ATP present in the muscle which provides two to three seconds of energy. At no time does the body store more than 85 g of ATP. This energy has the highest explosive power but is ephemeral. Since ATP cannot be supplied through the bloodstream or through tissues, it must be continually resynthesized in the cell. The body can then use the creatine phosphate (CP) available in the muscle cells to obtain lasting energy until approximately the second or fifteenth second (depending in particular on the subject's level of training).

The concentration of C P is approximately 3 to 5 times that of ATP. This is why CP is considered the high energy phosphate reserve.

The primary energy source available to the muscle is called “anaerobic alactic”. It uses the energy elements initially present in the muscle: ATP is the energy source allowing the sarcomeres to slide between them.

Creatine phosphate, by decomposing (CP – C+P+Energy) into creatine and phosphate, provides the energy for reconstituting the ATP used. This energy source appears to be immediately available, that is to say without any start-up delay. The peak power is considerable but its capacity is very limited so that in a few seconds (10 seconds at most) all reserves are exhausted. Furthermore, it produces no waste and does not need oxygen to function. (CHIGNON, 1984, p. 02)

1.3.1.1.3.1.2/ The anaerobic lactic sector

Once phosphate reserves are exhausted, the body turns to nutrients to find the necessary energy in their degradation. The first call is made from glucose. Carbohydrates are the only foods capable of providing the energy necessary for the formation of ATP anaerobically. The breakdown of carbohydrates also provides essential elements for the metabolism of lipids and proteins. The breakdown of glucose to provide ATP is called glycolysis. The energy extracted during anaerobic glycolysis represents 5% of the total quantity of energy produced by the total aerobic degradation of the glucose molecule. However, anaerobic energy is important because it is immediately available.

The second available energy source is called “anaerobic lactic”. Anaerobic because like the previous one, it can function in the absence of oxygen, lactic because unlike the previous one, it leads to the constitution of a by-product whose subsequent metabolism will be particular: lactic acid .This energy source also known as “glycolytic” ensures, through an enzymatic process, the degradation of glycogen and glucose present in the muscle cell (glucose – lactic acid + Energy). This degradation, as we have said, is incomplete and results in the formation of several bodies including lactic acid and its corollary the appearance of H+ ion. This energy source is quick to start but not instantaneous (a few seconds).

If necessary, it quickly reaches full power (in less than 30 seconds) and can also operate for a few minutes, maximum efficiency is between 1st and 2nd minutes. However, its capacity is limited and the output is already greatly reduced around the 4th minute. The in situ accumulation of waste products, in particular H+ ions, which

inhibits the enzymatic activity of glycolytic reactions, also contributes greatly to this limitation. (Dr. Samira, 2015-2016, p. 33)

1.3.1.1.3.1.3 / The aerobic sector

Anaerobic glycolysis transformed glucose into pyruvic acid, and the body draws from this pyruvic acid the 95% of energy remaining available by a very important mechanism called the Krebs cycle. The Krebs cycle ensures the aerobic transformation of the pyruvic acid, lipids and amino acids into ATP.

This transformation is carried out inside the mitochondria which play the role of energy center.

The third sector involves the degradation of glucose, lactic acid, certain amino acids (alanine), and especially free fatty acids in the presence of oxygen. there is aerobic glycolysis of glucose (glycogen) and aerobic glycolysis of lipids. (VERSON, n.d.)

The third energy source is called “aerobic” because it can only function with a supply of external oxygen. It is in fact an oxidative system which, when oxygen is in sufficient quantity, allows numerous and complex enzymatic reactions (Krebs cycle) to degrade the various substrates (glucose, lactic acid) down to their ultimate components CO2 and T H2O. certain amino acids, fatty acids) present in muscle cells or provided by the circulatory system. (CHIGNON, 1984, p. 2;3)

The Training promotes energy intake and its use with optimal efficiency to bring practical exercise to a higher level.

Muscle contraction requires ATP, produced in three ways:

• From phosphagen (ATP + phosphocreatine), very rapid but very limited production.

• Anaerobic glycolysis: from glucose, it produces lactic acid, does not use oxygen. Its yield is low: 3 molecules of ATP for one molecule of glucose phosphate.

• Aerobic degradation of carbohydrates and lipids:

- produces CO2 and H2O;
- requires oxygen taken from the air and transmitted to the muscles by the blood;
- its yield is excellent: 38 molecules of ATP for one of glucose phosphate.

The aerobic route is the most profitable. The more it works, the more oxygen will be required, the maximum intake and use of which will be VO2 max. The higher it is, the more it will allow a significant production of ATP, therefore increased work.

Its contribution to the muscles will be thanks to lungs, a heart and good quality blood.

Taking into account these notions and individual constants, we can improve the third way through exercises which lead to exhaustion in 7 or 8 minutes.

The second way (anaerobic glycolysis) exercises of 2 to 3 minutes. Protect phosphagen exercises for 10 to 15 seconds.

After preparatory work on the third way and gradual improvement in VO2 max, move on to the second way, then the third way.

This “in splits” is easily relearned. It should not last long, and should be carried out once VO2 max has been reached, and routes 2 and 3 have been followed in maintenance mode.)APFELBAUM. C. M(1989 ،

1.3.2/ physical effort

1.3.2.1/ Definition of effort

The terms aerobic, dynamic, isotonic and endurance are used interchangeably in the literature to define submaximal and prolonged efforts. Likewise, the terms anaerobic, static, isometric and resistance are synonymous, defining intense and brief efforts. (CONSTRAU.J.P, 1988)

1.3.2.2 / The different types of effort

There are two main types of effort: dynamic effort and static effort. What differentiates them is the cardio-respiratory position of the subject: the dynamic

effort is carried out with free breathing, the static effort is carried out with blocked breathing. These two types of effort produce different hemodynamic conditions, causing two almost opposite cardiovascular adaptations.

- **Dynamic effort:**

During this type of effort, the cardiovascular and respiratory functions work together to provide the active muscles with the necessary oxygen (O2). The cyclical contractions of the muscles which easily work the return of venous blood towards the heart, creating a true peripheral pump, are the most accomplished form of the starling effort. This increased cardiac return easily crosses the pulmonary capillary network and there follows good filling of the left ventricle. We therefore understand that this effort is accompanied by an increase in cardiac output which ultimately results in cardiovascular adaptation to the dynamic effort. promotes the development of the VG with a view to favoring the increase in flow. (GOLLOIS.D & GREGOIRE.M, 2007, pp. 143-144)

- **Static effort:**

During this type of effort, we observe a respiratory blockage in forced inspiration which raises the alveolar pressure to around 40mmHg. This pressure compresses the pulmonary capillaries, causing a slowdown and sometimes even a cessation of pulmonary capillary circulation. this results in an increase in the volume and pressure of the blood upstream of the lungs, in the pulmonary artery, the right ventricle, the right atrium and the vena cava, as well as a decrease in blood flow downstream of the lungs. in the pulmonary veins, the left atrium, the LV, the aorta and the greater circulation simultaneously, the static effort leads to an increase in blood pressure and the LV, which receives less blood, must increase its force of systolic contraction to overcome the rise in systolic BP. We therefore understand that static effort is accompanied by a slight increase in cardiac output and that ultimately cardiovascular adaptation of this type of effort promotes the development of the LV with a view to favoring the increase in its force of contraction (GOLLOIS.D & GREGOIRE.M, 2007, pp. 143-144)

1.3.2.2.1 / Endurance effort

It requires prolonged efforts, of medium intensity, several times a week. It promotes the aerobic pathway, that is to say the use of fats. We observe in the muscle an increase in vascularization, in the number of mitochondria, and a modification of contractile proteins, which evolve from fast forms to slow forms. These changes are established quickly, after a few weeks of training, but can disappear just as quickly if it is interrupted. (Dr. Samira, 2015-2016, p. 39)

1.3.2.2.2 / Power effort

It aims to improve strength and speed, and is based on different bases. In this case, it is not a question of carrying out long and repeated efforts, but, on the contrary, short, rapid and intense exercises, such as weight training or sprinting. These exercises should also be performed several times a week, and they lead to increased muscle strength, as well as muscle hypertrophy. We know that this hypertrophy is due to the multiplication of myofibrils and an increase in the diameter of fast fibers. But it is still difficult to explain how exercise leads to this physiological and anatomical phenomenon. At the biological level, we observe an increase in the level of certain hormones such as growth hormone or testosterone, which are necessary for protein synthesis, and therefore for increasing muscle volume. We also observe, in muscles made up mainly of fast fibers, a reduction in vascularization and mitochondria. (Dr. Samira, 2015-2016, p. 39)

1.3.2.3 / Consequence of physical training

The effects of training can be grouped into:

- peripheral modifications: metabolic.
- central modification: cardiac, respiratory.
- with consequences of changes in body mass, cholesterol and triglycerides, blood pressure and thermoregulation.

the effects of training depend on numerous parameters:

- genetic hereditary factors.
- type of program followed, as well as the energy sources used during exercise: aerobic, anaerobic - alactic, anaerobic – lactic.
- the initial degree of physical conditioning of the subject.
- and above all the intensity and volume of the training program. (Jean-Pierre & all, 1988)

1.4 / Adaptation of the body to exercise

Any physical effort requires an increase in oxygen consumption due to the increase in muscular work, this increase in O_2 consumption is made possible by is made possible by the adaptation to the effort of the respiratory function and circulatory, it is reasonable to think that to this adaptation of large devices to the new conditions created by effort, is added, in many cases, a metabolic adaptation at the cellular scale.

We cannot separate the adaptation of the cardiovascular system and that of the respiratory system.

The human body adapts to physical effort Any physical exercise leads to an increase in the activity of cardiac, respiratory and muscular functions.

To better understand the effects of physical activity on the human body, we must first know the fundamental process of its adaptation to exercise.

By adaptation we mean organic and functional changes caused by intrinsic and extrinsic demands. Adaptation is a reflection of the body's internal reactions. And comes to fruition particularly following an effort. Adaptation represents an intrinsic state of improvement in the capacity for physical activity or exercise. Adaptation or the capacity to adapt belongs to evolution and is an essential characteristic of life. Adaptation can be reversible, which is why, when necessary, it must be constantly renewed.

The adaptation of the body to the effort allows a better economy of cardiac functioning. We know that intensive overload of the heart muscle – never achieved in physiotherapy – causes an increase in the volume of the heart, this is cardiac

adaptation dilation. Movement therapy makes it possible to reduce the energy transformations of the myocardium, and the endurance capacity of the trained cardiac muscle increases significantly. (STIPPIG.J, 1991, p. 7)

1.4.1/ Types of adaptation

Physical training, through its repeated stimulation, allows chronic adaptation of the devices and systems involved.

Adaptation only affects devices and systems that are sufficiently stressed. This adaptation manifests itself in two kinds:

• Functional adaptation: it is characterized by changes in the efficiency of tissues, systems or devices. This is the case of the reduction in heart rate for a given work intensity.

• Structural adaptation: changes in the number or size of organic units, for example the increase in the number and size of mitochondria in the muscle and the increase in the diameter of the muscle fiber. (J, 1999, p. 41)

1.4.2/ Notions on the cardiovascular aspect

All physical exercise requires an adequate supply of oxygen and nutrients such as carbohydrates, lipids, proteins, vitamins, minerals and water for the cells. It is also necessary to eliminate the metabolic waste produced. This process is orchestrated by blood, which is pumped by the heart through a complex network of vessels: arteries, veins and capillaries. The performance of the cardiovascular system is directly linked to the ability to perform aerobic efforts. The more efficient this system is, the greater the capacity to sustain prolonged efforts will be.

1.4.2.1/ Cardiovascular adaptations

Cardiovascular adaptations must meet a triple challenge during the performance of a muscular exercise. First, they must deliver sufficient blood flow to active muscles through directed vasodilation, to meet metabolic demand. Then, they must maintain

sufficient perfusion pressure of the organs to allow them to maintain effective blood-tissue exchanges. Finally, they must limit, through sufficient cooling of the subcutaneous blood, the increase in body temperature which accompanies all muscular exercises. (Carré, Brion, & tout, 2013, p. 7)

Exercise requires the cardiovascular system to undergo various and specific adaptations. All have only one goal: to enable the cardiovascular system to best respond to increased needs, by optimizing transport conditions. These adaptations will concern: The cardiovascular system responds to the needs of exercise, physical exercise is accompanied by an increase in

1.4.2.1.1/Adaptation of heart rate

With the exception of the emotional charge with secondary tachycardia sometimes observed at the start of exercise, the heart rate increases linearly with the intensity of the exercise. It is not uncommon to observe a flattening of the HR curve at the end of the exercise.

The plateau constitutes the equilibrium heart rate, it is the optimal level at which the heart rate exactly meets the needs of the exercise. For each successive increase in exercise level, heart rate reaches a new plateau within 1 to 2 min. However, the more intense the exercise, the longer the time required for the heart rate to stabilize. (Dr. Samira, 2015-2016, p. 30)

1.4.2.1.2/Adaptation of stroke volume

the volume of blood ejected by the heart at each systole at rest is close, in a sitting or standing position, to 70.90 ml, it increases a little higher in a lying position (100.120 ml), it increases from the start of the exercise until 'at 40 to 50% of maximum oxygen consumption, then it peaks (130,150 ml) beyond, it can even decrease a little at maximum exercise. (MAGNIN.P & CORNU.J.Y, 1997)

Exercise; It is the main determinant of cardiorespiratory endurance capacity. It depends on four factors:

• venous return

• ventricular filling capacity

• ventricular contractility Blood pressure in the aorta and pulmonary artery. (H.WILMOINE & LCOSTILL, 2007)

1.4.2.1.3/ Cardiac output

Cardiac output is the product of heart rate and stroke volume. Knowing the variations of each of these factors during exercise.

At rest, cardiac output is approximately 5 $L.min^{-1}$. It increases linearly with the intensity of the exercise to reach 20 $L.min^{-1}$ in sedentary people and 40 L.min in highly trained endurance athletes. Absolute values may vary with size and training level. (H. Wilmore, L. Costill, & Kenney, 2009, p. 162)

1.4.2.1.4/ Blood pressure

Blood pressure is the pressure exerted by the blood on the walls of these vessels. It is conventionally expressed by two values: systolic pressure and diastolic pressure. The higher number corresponds to systolic blood pressure. It is in fact measured during ventricular systole of the heart, when the blood is ejected with the greatest power. The lower number corresponds to diastolic blood pressure. It is measured during ventricular diastole, when the heart is at rest. During this phase, the blood exerts a residual pressure in the arterial system. (H. Wilmore, L. Costill, & Kenney, 2009, p. 134)

1.4.2.1.5/ Blood flow

The increase in blood flow during exercise allows a greater quantity of blood to be expelled into the arterial system. It is still necessary that this additional volume is actually intended for the organs which need it the most, the active muscles. This is the objective of blood redistribution or circulatory balance. (H. Wilmore, L. Costill, & Kenney, 2009, p. 165)

CHAPTER 2
METHODS AND MEANS

2.1/ Methods and means

2.1.1/ Introduction

Scientific research requires a scientific methodology to reach the most important results. Accordingly, the nature of the research problem determines the scientific methodology that helps us address it. The research topic that we are about to study requires a lot of accuracy and clarity in the process of organizing and preparing field procedural steps to delve into the main research experiment, starting from choosing the appropriate method for the nature of the problem to be solved and the methods of selecting the research method, in addition to selecting the appropriate means and tools that are related to the nature of the research experiment. In this chapter, the two students presented an analysis of the research results and then discussed the hypotheses put forward as a solution to the research problem and verified their validity or denial and came up with a set of conclusions and recommendations, then the general conclusion.

2.1.2/ Cardiac rehabilitation of our study

2.1.2.1/ The cardiac rehabilitation service at EHS - Specialized Hospital Establishment Dr Maouche Mohand Amokrane:

Rehabilitation services at an establishment like EHS - Specialized Hospital Establishment Dr Maouche Mohand Amokrane are critical for helping patients recover and regain their optimal level of function after an injury, surgery, or medical condition.

The Cardiac Rehabilitation service aims to aid recovery after a heart attack, heart surgery, or other cardiac events. This comprehensive program offers supervised exercise programs designed to improve cardiovascular health, ensuring patients build strength and endurance safely. Education on heart-healthy living and risk factor reduction is provided to empower patients with the knowledge needed to maintain their health and prevent future cardiac issues. Stress management and counseling are integral components, helping patients cope with the emotional and psychological aspects of their recovery. Additionally, nutritional guidance is offered to promote heart health, emphasizing the importance of a balanced diet in maintaining cardiovascular wellness. This multifaceted approach supports patients in achieving a healthier, more active lifestyle post-cardiac event.

2.1.2.2/ The pathologies concerned by cardiac rehabilitation:

the cardiac rehabilitation service opens its doors to several pathologies in order to follow a rehabilitation program, among the cardiac pathologies we can cite:

- Coronary arteries (mono, double, triple and quadriple pentage, angioplasty)
- MI (stent, operated or severe)
- High blood pressure
- Medical treatment
- Cardiomyopathy
- Hyper or hypolipidemia
- Left rib stenosis
- Valvulopathy (valvular replacement)
- Obesity
- Respiratory failure
- Angina (stable or unstable)
- Asthma
- Pericardia

2.1.2.3/ Target population

In our research work, sixty-five files selected we chose coronary patients because of their high frequency compared to other patients. Coronary patients include bypasses and the various manifestations of coronary disease such as MI, angina and angioplasties.

2.1.2.4/Condition and progress of the experiment:

As for the conditions and progress of the experimental part of our study, at the (Dr. Maouche Mohand Amqrane Specialized Hospital Foundation), they cover 65 files of patients who came to the Sports Medicine Department for reasons related to coronary heart disease and with the aim of following a cardiac rehabilitation program.

2.1.2.5/ Cardiac rehabilitation program

The intervention under study was a cardiac rehabilitation program for coronary patients, standardized in a hospital setting on an outpatient basis, consisting of 3 weekly meetings of one and a half hours for an average of four weeks. The cardiac rehabilitation program was preceded by a medical, psychosocial, nutritional and functional assessment. The eligibility criteria for the program were as follows: absence of contraindications; motivation; smoking cessation, etc. The functional assessment makes it possible to determine a level of exercise that is both safe and capable of improving dyspnea and exercise tolerance. An assessment including a maximum exercise test was carried out before and after the cardiac rehabilitation program and another will be scheduled 6 months after the rehabilitation program.

Aerobic training (high-intensity endurance exercise on an ergocycle for 25 to 30 minutes at each meeting) constituted the main part of the program. The exercise intensity was 80% of the maximum power achieved during the exercise test performed before entering the rehabilitation program. The training sessions also included mid-program power exercises, walking at the patient's pace, stretching, and relaxation. In addition to the training program.

2.1.2.6/ Protocol

The protocol followed is standard for two different groups: that of operated patients includes 34 days and that of non-operated 29 days, a functional assessment is carried out before and after the cardiac rehabilitation program. A precise assessment of each patient is established by a doctor: interview, clinical examination, electrocardiogram, echocardiography and stress test in order to determine the level of risk. This assessment makes it possible to check the contraindications (pericarditis, tight aortic stenosis, heart failure, etc.), but also to adapt the physical exercise to the severity of the patient.

The rehabilitation protocol used contains 31 days for non-operated coronary patients and 33 days for operated patients. The rehabilitation sessions are divided into endurance work and power work as follows:

- Endurance work, from 1 to 14 days for non-operated patients, from 1 to 16 days for operated patients.

- The first power work: From 15 to 19 days: for non-operated patients, from 17 to 21 days for operated patients.

- Endurance work: from 20 to 24 days for non-operated patients, from 22 to 26 days for operated patients.

- The second power work: from 25 to 27 days for non-operated patients, from 27 to 29 days for operated patients.

- The last endurance work: from 28 to 29 days for non-operated patients, from 30 to 32 days for operated patients.

Each session includes: ten minutes of warm-up, 30 minutes of effective endurance exercises and five minutes of recovery.

The intensity of the effort is determined on the principle of heart rate. For each of them, it is calculated on the basis of a target heart rate to be reached for each patient: target HR according to the formula of Karvonen et al. = Resting HR + 60 to 70% (HRmax–Resting HR), and this, after performing a stress test conducted for each of them until the appearance of one of the following signs: shortness of breath (Borg scale), muscle fatigue, pallor, dizziness, chest pain, appearance of electrical signs of ischemia or rhythm disorders (most often ESV), and reaching high blood pressure figures. All these causes require stopping.

Rehabilitation exercises are performed on ergometers, under electrical monitoring by endoscopes. The support team includes a cardiologist, a sports doctor and two nurses. Blood pressure and heart rate are regularly noted in a patient monitoring log. These sessions take place in the premises of the sports medicine department with the cardiology department, the cardiological resuscitation department and the presence of the defibrillator inside the room nearby. Each patient underwent an average of 32 rehabilitation sessions, three sessions per week under the supervision of the support team. The endurance effort is initially performed on an ergometer at 50% of the maximum test power, then increments of

5 to 10 W are performed during the sessions according to tolerance and with respiratory ease until reaching the calculated threshold frequency, generally between 60 and 80% FMT. At the end of each patient's rehabilitation program, a stress test is performed with a new assessment made by the cardiologist for each of them. A questionnaire assessing the quality of life after this rehabilitation (satisfied, improved, useless, etc.) is given to each patient.

2.1.3/ Research method:

In order to be able to resolve the above-mentioned tasks and to be able to achieve the objectives set in departure for the theme, we resorted to the applications of the following methods:

2.1.3.1/ Bibliographic analysis method:

This has been of capital interest, thanks to its international rules

which codify and set the principles of exploitation of various literary

documents. To carry out our work, the bibliographic research relating to our theme was somewhat lacking due to the rarity specialized scientific literature, particularly regarding rehabilitation cardiovascular pathologies , an area very little addressed by researchers in our country. This which also motivated the choice of our theme in this area.

However, we resorted to sometimes with the few literary sources found, the original documents consulted are limited in despite borrowing from libraries:

IEPS of Mostaganem, We also consulted research published on

sites internet.

We also point out that we have had difficulties linked to the

absence of major classic works in the field of cardiac

rehabilitation.

2.1.4 / The choice of parameters to evaluate:

In a retrospective study, the work is limited to work already done. the chosen parameters are medical parameters that cardiac rehabilitation staff take for each patient during the cardiac rehabilitation program and the stress test. These parameters are based on medical records. Our work is limited to the collection of this data.

2.1.4.1/ heart rate (HR)

Heart rate is the parameter most often used to determine fitness capacity. recovery due firstly to the simplicity of its measurement and then to its informative value on the ability to return to work. The heart rate curve after exercise is like that of oxygen consumption a rapid decline phase then a slow phase.

There exists a relationship between oxygen consumption and heart rate during the first minutes of recovery. During the rehabilitation program, HR is measured before exercise, during exercise and after

2.1.4.2/ blood pressure (BP)

It should be emphasized the importance of blood pressure measurement in the field of health medicine. sport, because it tells us about the blood pressure and vascular adaptation of an individual.

As it can also testify to the level of development of the recovery capacity. Some researchers have highlighted the importance and impact of blood pressure, the fact that the aerobic exercise test causes an increase in blood pressure in the individual systolo-diastolic arterial. Diastolic pressure remains stable or decreases with exercise, which according to several researchers, would be an excellent sign of vascular adaptation 65.

In our study we opted for measuring blood pressure before and after as we measurement 5 min after exercise to determine the level of development of recovery capacity sick people.

Blood pressure is measured using a blood pressure monitor and a stethoscope.

2.1.4.3 / The stress test:

The exercise test (EE) is a necessary part of the diagnosis. Often essential for configuring the exercise retraining (RE), it is always interesting because it allows us to assess functional capacity, to quantify progress and refine the programming of retraining sessions. Important values that the stress test gives during rehabilitation are:

- Maximum heart rate. This research must always be authorized in advance by the doctor, because it can be dangerous in some patients. it will bemoved on the file of the patient to monitor their heart rate during the rehabilitation program.
- The theoretical maximum frequency calculated by the sports doctor.
- target heart rate: it is calculated for each patient: target HR according to the formula Karvonen et al.FCC =Resting HR + 60 to 70% (HRmax–resting HR),during the rehabilitation program three exercise tests are scheduled: one before rehabilitation, the second just after the program, after three or six months of retraining, a new test is program to measure performance improvement, thereby allowing a level of exercise to be prescribed higher while ensuring patient safety.

In our research work we were interested in the following parameters:

•The maximum load of the stress test

•The duration

•Maximum heart rate

•Resting heart rate

•Resting blood pressure

The preceding parameters were taken in 1st day ;17th day;27th day and last day cardiac rehabilitation in order to carry out a study comparison between the tests**.**

2.1.5/ Statistical calculation method:

In general, statistics considers phenomena that are not accessible in experience. It essentially comprises three phases:

• A material phase where it is a question of gathering data, grouping them and representing them in the form of tables or graphs.

• An analytical phase which consists of reducing the data to a limited number of parameters.

All of these two phases constitute the essential object of descriptive or deductive statistics whose results remain limited to the samples studied.

• An interpretative phase, which at the base of inductive statistics, it allows to deduce from the results obtained on a sample, conclusions relating to the entire population from which this sample is extracted. (RAMOUSSER.R & all, 1996)

In order to base our research work in a methodical and scientific manner, we have borrowed the following indices or parameters from the statistical method:

- The arithmetic mean represented by X
- The standard deviation represented by δ
- the analysis of variance.

NB / All our statistical calculations were processed with the statistical analysis software "stat box" on Computer.

CHAPTER 3:

PRESENTATION, INTERPRETATION AND DISCUSSION OF RESULTS

3/ Presentation, interpretation and discussion of the results

Introduction

In this part of our study, we will present the sample and its characteristics, conditions of the experiment, before presenting the results in the form of tables, histograms, for analysis and interpretation.

On this and taking into account certain theoretical data reported in certain works scientists used in the bibliographic analysis, we will focus on the discussion and interpretation of the results of our sample. Which will undoubtedly clarify for us, on the basis and the direction of writing the conclusions and recommendations of this study.

Finally, it should be noted that the latter is characterized by limits linked in particular to the aspect comparison of the results which perhaps do not cover all the aspects involved and to be evaluated, to aspire to more reliable results compared to a retrospective and prospective study to determine.

The Effects of Aerobic Training on Physical Performance in Subjects with Cardiac Diseases

3.1 / Presentation and analysis of results

The analysis of the results of our research is characterized by four parts:
The first will see the presentation and interpretation of data in the form of graph tables and theoretical analysis of the parameters taken into account during the cardiac rehabilitation program and during the two stress tests applied in the three chosen
center: CNMS Algeirs
The fourth part is a questionnaire submitted to patients undergoing the program of cardiac rehabilitation in each rehabilitation center for an evaluation of the appearance psychological,
Note that results are expressed as mean ± standard error, standard deviation and variance. The statistical significance of the results was assessed using p-value analysis.

3.1.1 / Presentation of parameter results during the program rehabilitation

For this first component which is characterized by the application of the rehabilitation program cardiac stress during exercise, in coronary subjects and taking into account the existing data in the medical records of the latter and the data taken during the prospective study carried out at the hospital Beni Messous,
In each center, we took data from the cardiac rehabilitation
program in choosing two days: the first and last day of cardiac
rehabilitation, and the data from
two exercise tests and which are respectively before rehabilitation and after rehabilitation.

3.1.1.1 **/ Parameters of the center's cardiac rehabilitation service national sports medicine**

- **The parameters of the cardiac rehabilitation program or training:**

- Resting heart rate;
- Maximum heart rate;
- Recovery heart rate; - The maximum load;
- Working hours

- **The parameters of the stress test:**

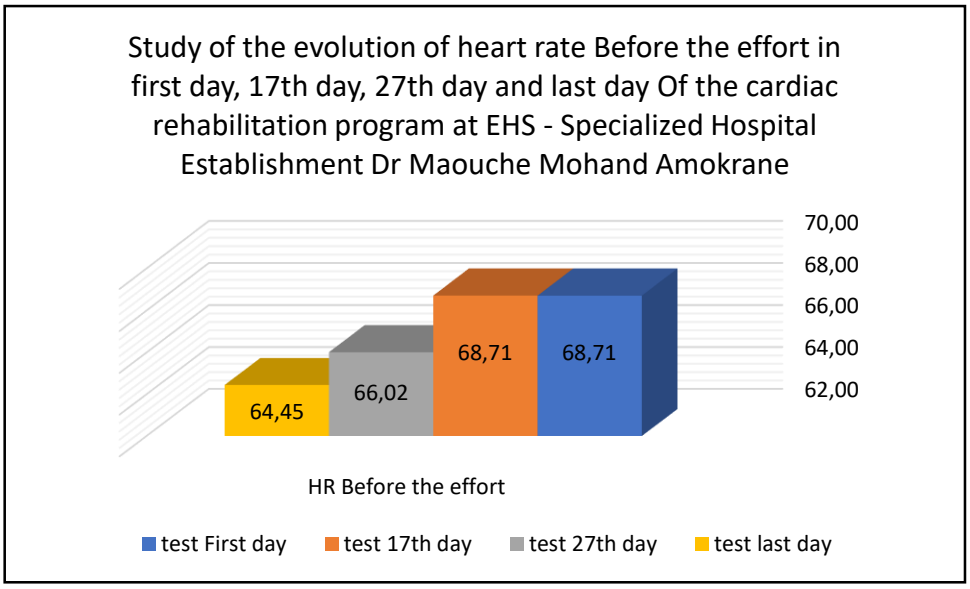
- the maximum load
- **the** maximum heartrate

* The duration in other words, it is necessary to explain that what will emerge in this chapter are the different parameters which are evaluated before and after the effort (before and after the training program cardiac rehabilitation) and the parameters of two exercise tests (before and after the cardiac rehabilitation program cardiac rehabilitation)
The results will be presented in the form of tables and histograms and the interpretation will be will make between the means as well as the standard deviations of each parameter and the variance of each parameter and the p-value will be compared throughout the rehabilitation program, that is to say before and after cardiac rehabilitation

The questionnaire allowed us to confirm the following hypothesis:
Aerobic training will signify improve the physical performance and cardio vascular health of individuals with heart disease compared to those who do not participate in regular aerobic exercise This was confirmed by the first question which we noted that there are patients who practice rehabilitation for more than five years and their health conditions allow them to practice rehabilitation heart rate on average three times a week On this, the results obtained from this research work made it possible to show that the responses of subjects to the cardiac rehabilitation program to exercise and exercise tests to assess the impact of this program on reconditioning Although sometimes the degree of significance of the difference between the means obtained, on the basis of the p-value analysis, is not important, it does not remain less than the improvement in the schematized results goes in favor of a clear improvement of the state of health of the subjects in our sample.
The scarcity of studies carried out in this area and relating to the parameters decided in the means and methods part of our research made it difficult to interpret the results noted. This was not at all the result of a well-developed comparison. However, through certain data that we have obtained, concerning the aspects evaluated in our study, we were able to establish the observation that the results of subjects in our sample remain beyond normal values commonly admitted.
Aerobic physical activity generally leads, in athletes as in patients, to a drop in heart rate at rest and an increase in systolic pressure with a widening of the systole diastolic differential during exercise: the diastolic pressure remains
So, and despite the cardiac pathology with its share of disturbances of the biological rhythm, in particular cardio-ventilatory rhythm which it is supposed to imply, we did not record any significant dispersion or imbalance in the results observed and resulting from our investigation. Witnesses, as such, of the level of performance of the subjects under consideration at the periods selected for the evaluation, namely, before and after cardiac rehabilitation. Even compared to standards collected elsewhere, the performance level of our subjects turned out to be satisfactory, this, of course, concerns the second period: after rehabilitation.

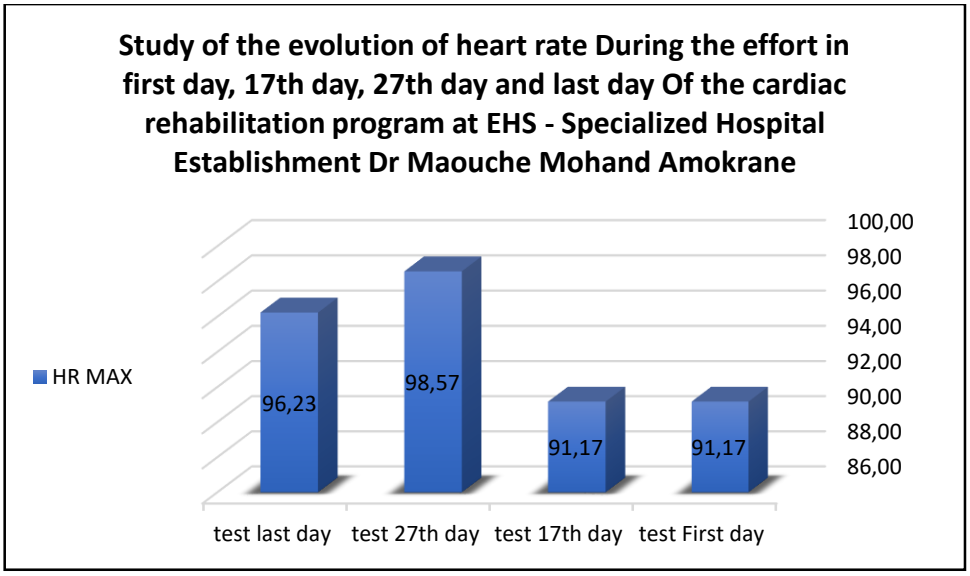
Table No 01: Study of the evolution of the test of cardiac rehabilitation HR before effort, HR max, HR after effort in the first day,17th day, 27th day, last day

The periods	statistics	arameters of cardiac rehabilitatic		
		HR Before the effort	HR MAX	HR After the effort
test First day	$\overline{X}$	68.71	91.17	65.48
	δ	11.02	13.54	8.51
	V	121.43	183.36	72.38
test 17th day	$\overline{X}$	68.71	91.17	65.48
	δ	11.02	13.54	8.51
	V	121.43	183.36	72.38
test 27th day	$\overline{X}$	66.02	98.57	65.88
	δ	9.57	12.10	8.02
	V	91.52	146.47	64.39
test last day	$\overline{X}$	64.45	96.23	64.89
	δ	7.19	12.10	7.26
	V	51.66	146.52	52.66
Units		bpm	bpm	bpm



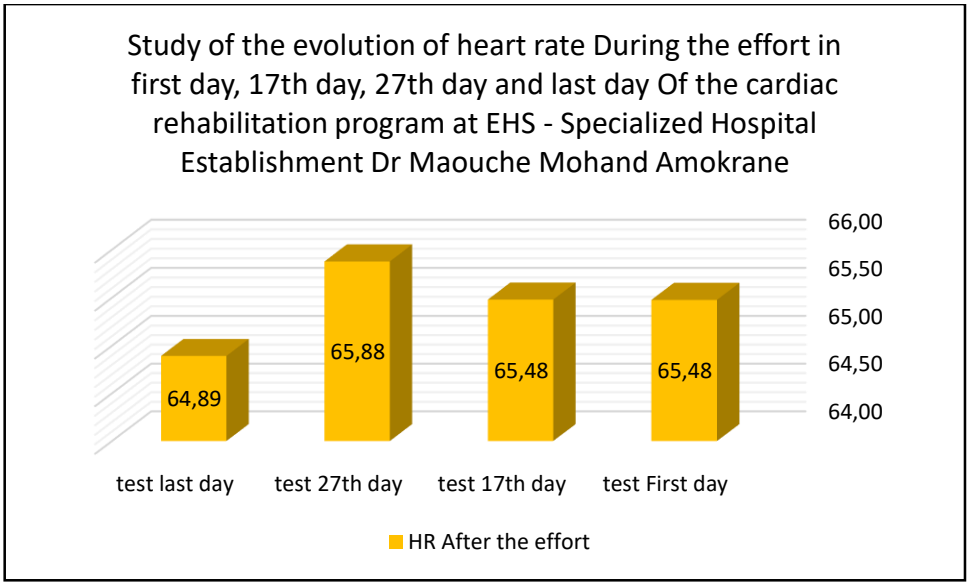
Histogram No 01: Study of the evolution of heart rate before the effort in first day, 17th day, 27th day last day.

The curve of the arithmetic means of this index for one evaluation HR before effort in periods is characterized by slight difference. The values of the first day is 64.45 and the 17th day is 66.02, the 27th day it is 68.71 and the last day it is 68.71 are the same values of moyen between 27th day and last day. Likewise, that the standard deviations which have changed compared to the foor test in the 1st day ,17th ,27th, and last day, the values of variance are changed between 11.02 and 7.19. The difference value analysis was found to be significant, in other words, at the total significance level alpha=0.05 we can reject the hypothesis zero equality of averages. In other words, the difference between the means is significant.



Histogram No 02: Study of evolution of heart rate During the effort in 1st day, 17th day,27th day, last day.

As for this parameter, the evolution test of during effort HR max, the values of the first day is 91.17 and the17th day is 91.17, the 27th day is 98.57 and the last day is96.57 so we saw the value the 27th day is high. Note the values of the standard deviations and variance remain linearly evolving in decreasing direction for the standard deviation with a value between 12.10 and 13.54, the value of variance is between 146.52 and 183.36. In other words, at the total significance threshold alpha =0.05 we can't reject the null hypothesis of equality of means, otherwise the difference between means is not significant.



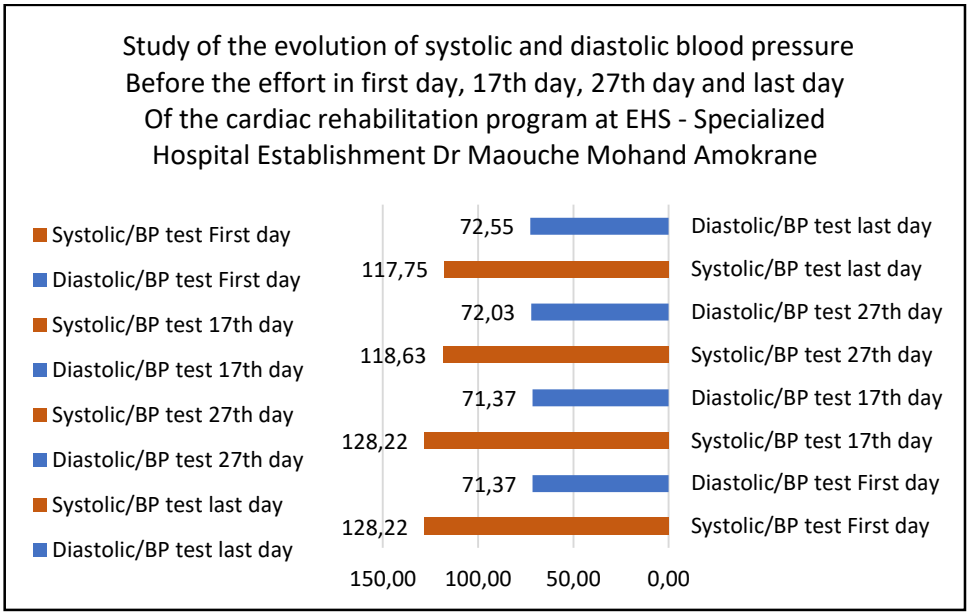
Histogram No 03: Study of the evolution of the heart rate HR After the effort in 1st day, 17th day,27th day, last day.

The curve of the arithmetic means of this index for the evaluation periods is characterized by slight difference. The value of the 1st day is 65.48, the value of last day is 64.89. the value of 17th day is 65.48 and the value of 27th day is 65.88. Note that the values of variance are between 52.66 and 72.38. The values of the deviation are between 7.26 and 8.51. recorded on the last day.

The difference value analysis turned out not to be non-significant. In other word sat the total signific level alpha=0.05 we cannot reject the hypothesis zero equality of the means, in another way the difference between the means significant.

TABLE No 02: Study of systolic and diastolic blood pressure Before and After the effort in first day, 17th day,27th day, last day of the cardiac rehabilitation program

The periods	statistics	Parameters of cardiac rehabilitation			
		Before the effort		After the effort	
		Systolic/BP	Diastolic/BP	Systolic/BP	Diastolic/BP
test First day	$\overline{X}$	128.22	71.37	114.43	69.08
	δ	20.24	15.18	18.84	11.00
	V	409.77	230.46	354.87	121.01
test 17th day	$\overline{X}$	128.22	71.37	114.43	69.08
	δ	20.24	15.18	18.84	11.00
	V	409.77	230.46	354.87	121.01
test 27th day	$\overline{X}$	118.63	72.03	107.88	63.83
	δ	16.40	9.60	12.59	9.14
	V	268.92	92.22	158.45	83.55
test last day	$\overline{X}$	117.75	72.55	110.65	68.06
	δ	13.03	6.86	11.47	8.02
	V	169.91	47.13	131.51	64.25
Units		Mm Hg	Mm Hg	Mm Hg	Mm Hg



Histogram No 04: Systolic and Diastolic blood pressure Before the effort in 1st day,17th day, 27day, last day.

Before the effort systolic blood pressure

the curve of the arithmetic means of this index for the two evaluation periods is characterized by slight difference. The value of the first day is 128.22 and the 17th day is 128.22, the27th day is 118.63, and the last day is 117.75.

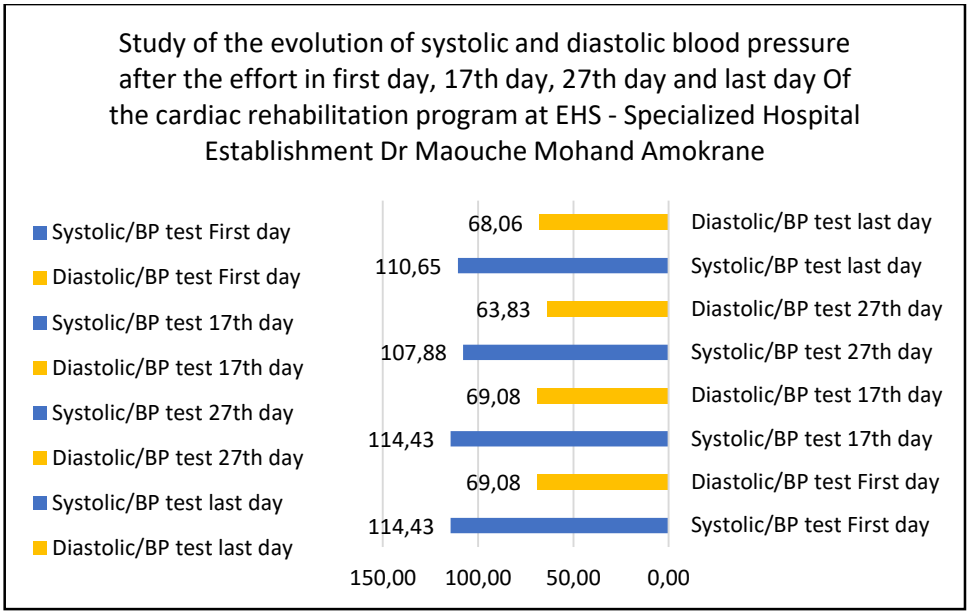
Note that the values of the standard deviation are between 13.03 and 20.24.

the value of variance is between 169.91 and 409.77 The difference value analysis was found to be no significant, it is 0.05 In other words at the total significance threshold alpha =0.05 we cannot reject the null hypothesis of equality of means, otherwise the between means is not significant.

Before diastolic blood pressure

The curve of the arithmetic means to this index for the two evolution periods is characterized by slight difference. The value of the 1st day is 71.37 and 17th day is 71.37 and the 27th day is 72.03 and the last day is 72.55. For the standard deviations values are between 6.86 and 15.18. the values of the variance are between 47.13 and 230.46.

the difference established on the basis of the value T student analysis is 0.45 which translates into non significance on a statistical level alpha =0.05 we cannot reject the null hypothesis of equality of means. In order words, the difference between the means is not significant.



Histogram No 05:
Systolic and Diastolic blood pressure after the effort in 1st day,17th day, 27th day, last day.

After the effort systolic blood pressure

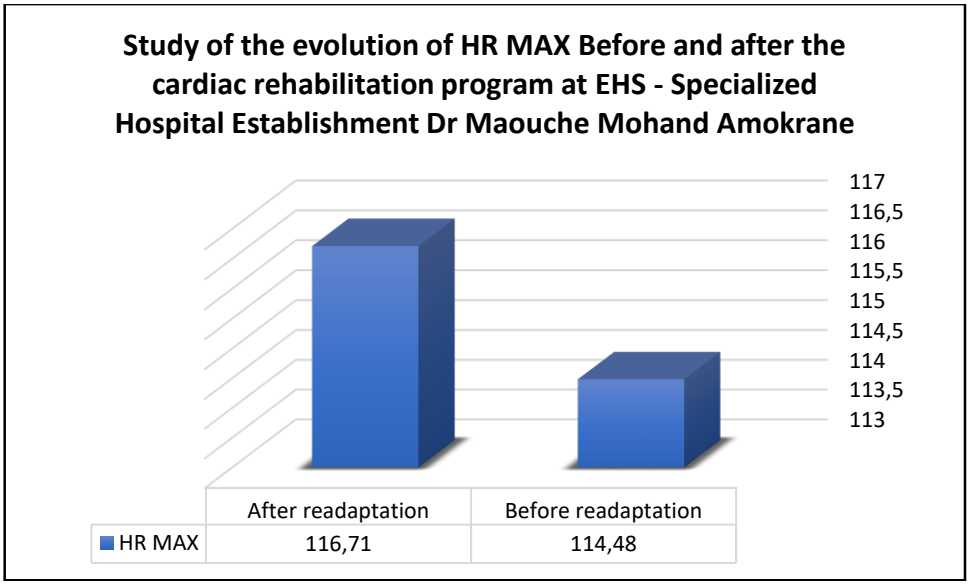
the curve of the arithmetic means of this index for the two-evaluation period is characterized by slight difference. The value of the first day is 114.43 and the 17th day is 114.43, the 27th day is 107.88 and the last day is 110.65 Note that the value of the standard deviation is between 11.47 and 18.84 the values of the variance are between 131.51 and 354.87. The different value t student was found to be no significant, it is 0.03. In other words, at total significance threshold alpha =0.05 we cannot reject the null hypothesis of equality of means otherwise the between means is not significant.

After diastolic blood pressure

The curve of the arithmetic means of this index for the two evolution periods is characterized by slight difference. The value of the 1st day is 69.08 and the 17th day is 69.08 and the 27th day is 63.83 and the last day is 68.06 For the standard deviations values are between 8.02 and 11.00 the variance values are between 64.25 and 121.01 The difference established on the basis of the value t student and p-value analysis is 0.44 which translates into non-significance on a statical level alfa=0.05 we can not reject the null hypothesis of equality of means, in order words the difference between the mean is not significant.

TABLE No 03: Study of the evolution the periods Before and After rehabilitation of parameters of cardiac rehabilitation in first day and last day

The periods	statistics	Parameters of cardiac rehabilitation
		HR MAX
Before readaptation	$\overline{X}$	114.48
	δ	18.63
	V	346.97
After readaptation	$\overline{X}$	116.71
	δ	17.54
	V	307.62
Units		bpm



Histogram No 06: Comparative study of the evolution of HR MAX Before and After the cardiac rehabilitation program.

We recorded a difference in the values of this parameter. In fact, the averages arithmetic values are 114.48 for first day before rehabilitation, after rehabilitation for increase to 116.71 on the last days of cardiac rehabilitation program. Likewise, that the standard deviations which have changed compared to the two periods and which are respectively 18.63 and 17.54. The variance values recorded in this parameter during the two periods are respectively 346.97 and 307.62. The difference established based on the p-value analysis is 0.24, which translates into non-significance at the statical level, that is to say at the total significance threshoid alpha=0.05 we cannot reject the null hypothesis of equality of means. In other words, the difference between the means is not significant.

3-2/ Interpretation and discussion of the results

The parameter of the cardiac rehabilitation program

During the rehabilitation program carried out at the national sports medicine center, and analysis of p-value with some parameters taken on the first day and the last day of rehabilitation such as resting heart rate, maximum heart rate, maximum load and duration, revealed that the difference between the means is significant which allows us to compare the results to those obtained in other research cited previously such as the maximum load and the duration maximum heart rate, resting heart rate corresponds**.** noted after complete rest in a lying position (approximately 10 minutes of inactivity). Resting HR will decrease after regular training, thanks to an increased work capacity of the heart The following effects have been scientifically demonstrated: reduction in heart rate at rest and during exercise this theory was revealed in our research work, so we observed a decrease in resting heart rate from 68.71 beats/ min on the first day to 64.45 beats/ min on the last day of rehabilitation. Regarding the frequency maximum heart rate, the difference between the means is not significant.

CONCLUSIONS AND RECOMMENDATIONS

General Conclusion

Our study shows the importance of cardiac rehabilitation in coronary heart disease through functional improvement on the physical, clinical and psychological aspect and reintegration socio-professional of patients It is an integral part of the chain of care set up within.

There have been no serious incidents or accidents. On the electrical level no worsening. The responses to the questionnaires given to patients revealed a clear improvement in quality of life with reduced fear of illness and reintegration faster socio-professional development.

On a physical level, the benefit can be objectified by the improvement in performance at effort and resumption of daily activities such as outdoor walking….

On a psychological level, early rehabilitation with rapid exit from the hospital environment seems to be one of the factors for a less delayed return to work.

There are therefore more and more chronic coronary patients alive.

Among these, many present dysfunctions at work or during their leisure time, which decreases

their quality of life. Furthermore, when it comes to maintaining the benefits for as long as possible acquired by acute treatment, and it is for these multiple reasons that coronary patients suffer and fear the effects of physical activity on cardiac function while fearing other complications. Cardiac rehabilitation is here, a great help to regain self-confidence and practice safe activities.

This is why the present retrospective and prospective research is proposed as a study dealing with only part of the problem posed by the adaptation of a specific program of the cardiac rehabilitation to exercise in coronary patients, it is the result of questions arising from

field activity (practitioners and patients) and their apprehension regarding the effect of the exercise physical and physiologically positive responses of the organism, without switching to the side complications.

Starting from the analysis and discussion of the results of our research

from which the answers to questions posed in problematic, (How does aerobic training affect physical performance in individuals with heart disease?)

It can be deduced that cardiac exercise rehabilitation has a significant impact on the physical reconditioning among coronary patients
Moderate or sustained physical activity has numerous health benefits, and learn to live with heart disease through advice on diet, physical activity and general lifestyle.
The Aerobic training does affect physical performance in people with heart disease.
Aerobic training will significantly improve the physical performance and cardiovascular health of individuals with heart disease compared to those who do not participate in regular aerobic exercise, this hypothesis is true.
They are important objectives, to assess the impact of aerobic training on the physical performance of individuals with heart disease.
Second, to evaluate change cardiovascular health makers, such as as blood pressure and heart rate following a period of aerobic training.
To measure improvement in exercise capacity and endurance in heart disease patient who engages in aerobic training.
To compare the incidence of adverse cardiac events between patients participating in aerobic training and those who do not.
In relation to the main hypothesis, the present study having treated the evolution of certain clinical parameters in cardiac pathologies patients, before and after a cardiac rehabilitation program at the effort in EHS - Specialized Hospital Establishment Dr Maouche Mohand Amokrane;
allowed us to put in place certain reference standards for the control and evaluation of the level of physiological adaptation of the body to the effect of physical exercise.
As it also allowed us to become aware of the physiological potential and psychology of the targeted population.
We confirm that on a fundamental level, the study is likely to provide useful

information on the level of physiological adaptation of the coronary artery's body to the effect of physical exercise in cardiac rehabilitation. On an applied level, the study provided a response to the
question that many practitioners ask themselves, namely how to manage and implement a training program cardiac rehabilitation in coronary patients, without risk of failure, despite disruptions to their psychological biological rhythm.

At the end of everything that is deduced as the results of this research work, it is easily possible to conclude and support the theory of the effectiveness of physical training on morbidity and mortality after a cardiac event. Physical activity, at this level is one of the essential determinants of good health, whether for a healthy individual or for patient's heart diseases.

This physical activity not only has effects on the performance capacity of the heart muscle itself or a protective effect against cardiovascular problems, but tends also to reduce certain risk factors which are responsible for cardiovascular pathologies, such as: coronary insufficiency which corresponds to all cardiovascular manifestations to a mismatch between myocardial oxygen supplies and needs. Pathology long considered a contraindication to physical activity before it was demonstrated that cardiac rehabilitation helps improve physical fitness by reducing complications cardiovascular.

Recommendations

Cardiovascular rehabilitation involves a set of therapeutic, educational and physical retraining measures. The beneficial effects of physical exercise on the cardiovascular system but also on the general metabolism of carbohydrates, lipids and on the mental state of patients explain why it remains the main element of rehabilitation for coronary patients. Even if it is difficult to separate its share from that of educational actions on secondary prevention and mortality, we now know perfectly well its role in the fight against heart disease. Its beneficial role in reducing blood pressure, improving lipid and carbohydrate metabolism, weight control and to a lesser extent in stopping smoking is also recognized and other risk factors.

Patient care has therefore evolved considerably. The means of intervention have been adapted to best approach the objectives of rehabilitation according to the definition proposed by the World Health Organization: "Cardiovascular rehabilitation is the set of activities necessary to favorably influence the evolutionary process of the disease, as well as to ensure patients the best possible physical, mental and social condition, so that they can, through their own efforts, preserve or resume as normal a place as possible in the life of the community"

Many authors have demonstrated the improvement linked to the care of coronary patients, participation in a cardiac rehabilitation program allows to obtain a benefit on the physical, clinical and psychological level. It should be noted that, to be able to improve quality and life expectancy by regularly carrying out cardiac rehabilitation exercises.

It is clearly proven that reconditioning to effort improves the vital prognosis and quality of life of coronary patients. The studies evaluating the benefit/risk ratio of this therapeutic strategy are old and the patients in our rehabilitation centers are therefore not treated as in other rehabilitation centers, and this is due to some differences, for this we propose some recommendations:

- The cardiac rehabilitation program must include endurance sessions and dynamic resistance sessions in order to ensure muscle strengthening.
- Each endurance session includes for example a warm-up period of 5 to 10 minutes, a work phase of 20 to 45 minutes and a period of at least 5 minutes plus gymnastic exercises the number of sessions is 3 to 5 sessions per week to obtain a significant improvement in functional capacities.
- The cardiovascular pathology is assigned to a cardiologist who has benefited, if possible, from post-university training in cardiac rehabilitation. The medical team alongside him may include other specialists such as diabetologists, tobacco specialists,. Mandatory paramedical skills include nursing professions, physiotherapists, dieticians, the presence of a psychologist is highly desirable. The paramedical team may also include other skills: nursing assistant, adapted physical activity teacher, occupational therapist, etc.

- Cardiovascular rehabilitation is traditionally done in coronary patients but can in fact be extended to other cardiac pathologies, it consists of practicing exercises constituting endurance or aerobic training either in the hospital or outside the rehabilitation department.
- Physical exercise is part of the prevention and treatment measures for many diseases, particularly cardiovascular diseases. a large number of patients exercising physical activity as part of their rehabilitation to exercise and by exercise following medical treatment.

BIBLIOGRAPHIC REFERENCES

REFERENCES:

Adrignola, AmWengert, Bfatafehi, & and all. (n.d.). The cardiovascular system. *Human Physiology*.

Carré, F., Brion, R., & tout, e. (2013). *Cardiologie du sport.* Bruxelles: De Boeck Supériur s.a. doi:978-2-8041-8160-4

CHIGNON, P. C. (1984). *rééducation et réadaptation cardio-vasculaire.* édition MASSON.

CONSTRAU.J.P. (1988). *cardiologie sportive.* édition Masson.

Dr. Samira, S. A. (2015-2016). L'effet de la réadaptation cardiovasculaire à l'effort jsur l'aspect physique, clinique et psychologique chez les coronariens. *Thèse Doctorat en théorie et méthodologie de l'éducation physique et sportive*. Université d'Alger 3 Institut d'éducation physique et sportive.

.Paris: Masson .*Diététique et nutrition* .(1989) .FORRAT. P, NILLUS APFELBAUM. C. M

GOLLOIS.D, L., & GREGOIRE.M. (2007). *la préparation physique.* édition Masson.

H. Wilmore, J., L. Costill, D., & Kenney, W. (2009). *physiologie du sport et de l'exercice.* Bruxelles: De Boeck. doi:978-2-8041-0158-9

H.WILMOINE, J., & LCOSTILL, D. (2007). *physiologie du sport et de l'exercice.* paris: édition de Boeck université.

J, V. (1999). Importance de la nutrition chez le sportif : morphologie et nutrition. *Médecine du Sport*.

Jean-Pierre, C., & all, a. (1988). *cardiologie sportive.* édition MASSON.

M, R. (1986). *general princupes of vascular. In human circulation :regulation during physical stress.* new york: oxford university press.

MAGNIN.P, & CORNU.J.Y. (1997). *médecine du sport et accompagnement médicaux.* édition ellipses Marketing SA.

MARIEB, E. N. (2005). *Anatomie et physiologie humaines* (éd. 6e édition). France: Pearson Education . doi:2-7440-7118-8

Marieb, E. N. (s.d.). *Biologie humain principe d'anatomie et de physiologie* (éd. 8e édition). doi:978-2-35745-020-2

RAMOUSSER.R, & all. (1996). *introduction au statistique.* L Citation.

STIPPIG.J. (1991). *gymnastique du cardiaque.* édition prodim.

❖ The websites:

American Heart Association editorial staff and reviewed by science and medicine advisors. (2022, 12 5). *American Heart Association*. Retrieved from https://www.heart.org.

clinic, c. (2021, 09 07). *Blood Vessels*. Retrieved from https://my.clevelandclinic.org.

FÉDÉRATION FRANÇAISE DE CARDIOLOGIE. (2021, 05 09). Récupéré sur https://www.fedecardio.org/je-m-informe/peut-on-faire-du-sport-avec-un-probleme-cardiaque/.

Guys and St Thomas Specialist Care. (n.d.). *Valvular heart disease*. Retrieved from https://guysandstthomasspecialistcare.co.uk.

Infarctus du myocarde. (2024, 03 04). Récupéré sur https://www.vidal.fr.

Mitchell, K., & Altomara, D. (2023, 12 18). *Causes of High Blood Pressure*. Retrieved from https://www.webmd.com.

VERSON, T. (s.d.). *physiologie de l'exercice*. Récupéré sur http:/ /t .verson@free.fr/.

world Health Organization. (2022, 10 5). Récupéré sur https://www.who.int/news-room/fact-sheets/detail/physical-activity.

❖ Dictionary:

Oxford Dictionary

❖ Arabic References:

الزهرة، ب &., لعرج, ش .(2021-2022) .بروتوكول إعادة تأهيل بالأنشطة البدنية لتحسين القدرة القلبية التنفسية واسترجاع التحمل العضلي بعد الاصابة بكوفيد- 19 .مذكرة *مقدمة ضمن متطلبات نيل شهادة الماستر في النشاط البدني الرياضي المكيف والصحة*. وهران.

د. عائد فاضل ملحم. (2011). *الطب الرياضي والفسيولوجي قضايا ومشكلات معاصرة*. الاردن: مؤسسة حمادة للدراسات الجامعية والنشر والتوزيع. doi:978-9957-491-73-4

ANNEXES

Data collected from the stress test:

Para Sujet	Before the effort				After the effort			
	HR Max	Charge	Duration	IRE	HR Max	Charge	Duration	IRE
1	96	100	180	0,50	94	125	120	0,74
2	134	100	120	2,21	129	125	120	1,5
3	123	100	120	0,81	132	125	120	0,95
4	160	75	180	0,93	153	125	180	3,11
5	103	75	180	0 ,76	121	125	120	0,56
6	112	75	120	1,57	145	125	120	2,28
7	108	100	180	2,25	123	125	180	1,85
8	113	150	180	0,18	104	125	120	.,32
9	151	100	120	2,23	154	125	60	1,96
10	121	100	120	1,43	108	125	120	1,05
11	113	120	120	0,68	97	100	120	0,67
12	116	100	120	0,84	106	125	120	28,5
13	100	100	120	0,80	123	125	120	1,11
14	127	100	120	4	126	100	120	5
15	130	100	120	1,68	132	100	120	0,65
16	135	100	120	72	141	125	120	0,76
17	111	100	120	1,42	110	125	180	1,63
18	85	75	180	0,58	104	125	180	0,54
19	118	100	120	0,95	121	125	120	0,9
20	103	100	120	1,1	111	125	120	1,01
21	121	125	180	0,63	117	125	300	1,43
22	129	75	180	0,66	151	125	120	1
23	92	100	120	0,5	81	100	120	0,61
24	103	75	120	3,16	118	100	120	2,96
25	140	125	180	4,33	129	125	120	
26	107	100	120	0,96	122	100	180	1,28

27	93	50	180	2,2	94	100	120	23,5
28	99	100	120	1,83	109	100	120	1,67
29	107	100	120	3,58	96	125	180	2,69
30	148	100	120	1,2	138	125	120	1,47
31	131	125	60	0,6	124	125	120	0,84
32	90	75	180	1,75	97	75	60	2,1
33	68	75	120	2,25	100	75	120	4,5
34	122	75	105	0,77	135	75	30	0,65
35	136	75	60	2	131	75	120	2,33
36	120	100	120	0,96	123	125	60	1,01
37	118	100	120	0,82	121	100	120	1,75
38	117	100	90	1,34	120	100	120	1,55
39	137	100	120	1,43	110	100	180	0,40
40	104	75	120	3,87	121	100	120	2,66
41	117	100	120	2,1	123	100	180	2,2
42	108	75	120	1,25	112	100	120	0,52
43	91	75	120	1,4	92	75	180	1,6
44	118	100	120	1,66	124	125	120	1,5
45	82	75	150	1,1	82	100	60	1,06
46	111	100	60	3,33	92	75	120	1,96
47	91	75	120	2,25	96	100	180	1,41
48	120	100	60	1,67	103	125	60	1,45
49	83	50	60	2	89	75	120	2,62
50	68	75	120	0,68	100	75	180	1,35
51	113	100	120	3,77	110	125	60	3
52	123	75	120	1,31	147	100	120	2
53	105	75	120	1,33	118	125	120	0,59
54	123	100	60	2,1	135	125	120	3,18
55	100	75	120	1,36	110	125	60	2,58
56	112	75	120	1,12	120	100	180	1,45

57	133	75	120	2,3	101	125	60	0,92
58	112	75	120	2,01	114	100	120	1,13
59	125	75	120	1,97	131	100	120	0,97
60	123	50	120	1.09	99	75	180	1.03
61	133	100	120	0,97	127	125	60	0,88
62	128	75	60	1,31	101	125	120	1,02
63	133	100	60	4,06	136	125	120	2,72
64	107	100	60	0,92	110	125	60	0,95
65	141	100	60	5,45	143	100	120	4,8
Units	bpm	Watts	Seconds		bpm	Watts	Seconds	

Annex « D »

PARAMETERS OF THE 1ST DAY BEFORE, DURING AND AFTER THE EFFORT

PARAMETERS / Subjects	After the effort			During the effort			Before the effort		
	HR	Systolic/BP	Diastolic/BP	HR/Max	Duration	Charge max	HR	Systolic/BP	Diastolic/BP
1	68	100	60	88	40	50	64	100	50
2	84	100	60	100	20	50	72	100	75
3	82	120	80	110	30	50	80	130	70
4	68	120	70	98	20	30	82	100	60
5	60	130	70	86	23	30	60	120	85
6	52	115	60	84	30	30	56	105	75
7	72	120	70	96	15	30	60	140	80
8	54	160	80	90	40	50	64	120	70
9	93	140	90	119	20	50	80	110	70
10	59	137	73	112	40	50	56	110	70
11	58	160	10	110	45	50	60	160	90
12	68	100	60	110	20	30	70	111	60
13	64	120	80	90	40	75	56	120	75
14	83	100	50	112	40	50	80	105	65
15	88	144	73	100	30	10	76	115	70
16	60	140	80	116	45	50	68	111	55
17	76	111	80	96	30	25	76	120	80
18	67	135	80	72	40	50	64	115	80

19	63	110	61	105	35	50	80	90	55
20	85	125	75	97	40	30	76	100	60
21	69	115	60	94	40	50	70	100	65
22	75	94	59	85	40	30	60	85	40
23	66	159	67	78	40	30	62	135	70
24	65	120	70	87	40	30	60	105	50
25	68	100	70	112	35	50	68	95	70
26	52	100	60	80	40	30	48	90	55
27	76	150	75	84	40	50	68	145	80
28	64	150	85	68	40	30	60	120	80
29	70	140	80	78	40	30	58	125	80
30	83	130	90	99	40	30	70	111	70
31	60	111	50	84	40	30	60	95	60
32	63	130	80	72	30	10	64	100	60
33	57	120	65	66	35	30	60	100	60
34	93	150	80	101	15	10	76	140	70
35	65	135	75	110	30	30	75	115	70
36	62	119	83	105	35	50	62	100	60
37	64	109	56	94	45	30	56	100	65
38	91	105	70	104	28	30	86	105	60
39	89	148	78	106	30	30/	63	130	70
40	51	134	65	88	40	50	50	100	50
41	56	90	60	86	35	30	52	90	60
42	79	169	80	76	35	30	60	160	80
43	66	151	58	84	40	30	68	130	75

44	61	120	75	110	40	50	56	111	75
45	60	139	88	69	45	30	60	140	60
46	68	169	88	89	35	30	66	150	75
47	65	135	89	69	35	30	60	120	70
48	72	130	80	85	35	30	66	130	90
49	66	150	80	78	30	30	68	145	80
50	57	120	65	66	35	30	60	100	60
51	54	164	80	103	15	10	54	160	70
52	73	111	80	84	35	30	70	95	60
53	52	150	10	70	35	30	52	151	85
54	64	111	60	88	35	30	60	100	60
55	74	120	80	97	23	30	68	125	75
56	68	113	72	87	30	30	64	105	65
57	58	130	80	92	35	30	68	111	85
58	64	117	72	80	42	30	68	95	60
59	80	137	84	97	35	30	70	111	80
60	64	125	64	84	35	30	60	105	80
61	77	90	70	97	30	30	72	90	95
62	68	151	79	82	35	30	64	120	75
63	82	144	97	93	30	30	74	100	75
64	61	154	81	77	30	30	60	105	60
65	90	138	87	97	30	30	80	111	60
units									

Annex « E »

PARAMETERS OF THE 17TH DAY BEFORE, DURING AND AFTER THE EFFORT

Parameters / Subjects	After the effort			During the effort			After the effort		
	HR	Systolic/BP	Diastolic/BP	HR/Max	Duration	Charge max	HR	Systolic/BP	Diastolic/BP
1	68	100	60	88	40	50	64	100	50
2	84	100	60	100	20	50	72	100	75
3	82	120	80	110	30	50	80	130	70
4	68	120	70	98	20	30	82	100	60
5	60	130	70	86	23	30	60	120	85
6	52	115	60	84	30	30	56	105	75
7	72	120	70	96	15	30	60	140	80
8	54	160	80	90	40	50	64	120	70
9	93	140	90	119	20	50	80	110	70
10	59	137	73	112	40	50	56	110	70
11	58	160	10	110	45	50	60	160	90
12	68	100	60	110	20	30	70	111	60
13	64	120	80	90	40	75	56	120	75
14	83	100	50	112	40	50	80	105	65
15	88	144	73	100	30	10	76	115	70
16	60	140	80	116	45	50	68	111	55
17	76	111	80	96	30	25	76	120	80
18	67	135	80	72	40	50	64	115	80

19	63	110	61	105	35	50	80	90	55
20	85	125	75	97	40	30	76	100	60
21	69	115	60	94	40	50	70	100	65
22	75	94	59	85	40	30	60	85	40
23	66	159	67	78	40	30	62	135	70
24	65	120	70	87	40	30	60	105	50
25	68	100	70	112	35	50	68	95	70
26	52	100	60	80	40	30	48	90	55
27	76	150	75	84	40	50	68	145	80
28	64	150	85	68	40	30	60	120	80
29	70	140	80	78	40	30	58	125	80
30	83	130	90	99	40	30	70	111	70
31	60	111	50	84	40	30	60	95	60
32	63	130	80	72	30	10	64	100	60
33	57	120	65	66	35	30	60	100	60
34	93	150	80	101	15	10	76	140	70
35	65	135	75	110	30	30	75	115	70
36	62	119	83	105	35	50	62	100	60
37	64	109	56	94	45	30	56	100	65
38	91	105	70	104	28	30	86	105	60
39	89	148	78	106	30	30/	63	130	70
40	51	134	65	88	40	50	50	100	50
41	56	90	60	86	35	30	52	90	60
42	79	169	80	76	35	30	60	160	80
43	66	151	58	84	40	30	68	130	75

44	61	120	75	110	40	50	56	111	75
45	60	139	88	69	45	30	60	140	60
46	68	169	88	89	35	30	66	150	75
47	65	135	89	69	35	30	60	120	70
48	72	130	80	85	35	30	66	130	90
49	66	150	80	78	30	30	68	145	80
50	57	120	65	66	35	30	60	100	60
51	54	164	80	103	15	10	54	160	70
52	73	111	80	84	35	30	70	95	60
53	52	150	10	70	35	30	52	151	85
54	64	111	60	88	35	30	60	100	60
55	74	120	80	97	23	30	68	125	75
56	68	113	72	87	30	30	64	105	65
57	58	130	80	92	35	30	68	111	85
58	64	117	72	80	42	30	68	95	60
59	80	137	84	97	35	30	70	111	80
60	64	125	64	84	35	30	60	105	80
61	77	90	70	97	30	30	72	90	95
62	68	151	79	82	35	30	64	120	75
63	82	144	97	93	30	30	74	100	75
64	61	154	81	77	30	30	60	105	60
65	90	138	87	97	30	30	80	111	60
unité									

Annex « F »

Parameters of the 27th day before, during and after the effort

Parameters / Subjects	Before the effort			During the effort			After the effort		
	HR	Systolic/BP	Diastolic/BP	HR/Max	Durée	Charge	HR	Systolic/BP	Diastolic/BP
1	64	105	60	100	30	100	95	100	50
2	78	90	50	104	40	100	66	100	60
3	80	111	70	110	42	100	72	110	60
4	66	111	70	100	45	50	84	110	60
5	115	106	68	113	36	100	60	115	70
6	56	90	60	100	35	100	56	100	60
7	66	120	80	120	40	100	58	110	70
8	70	150	80	120	50	100	68	125	60
9	86	130	80	92	50	100	72	120	60
10	56	115	65	100	54	100	60	100	50
11	66	160	85	112	40	50	60	130	75
12	56	120	70	92	40	100	54	110	60
13	60	110	60	120	40	100	80	130	70
14	64	110	70	100	40	100	76	90	50
15	72	110	60	96	45	50	64	90	50
16	64	115	70	100	40	100	64	105	60
17	74	100	70	96	40	100	76	90	50

18	68	120	75	97	44	100	66	115	80
19	68	90	50	90	42	100	70	90	60
20	76	120	75	100	35	100	70	110	70
21	73	105	60	100	30	100	72	100	60
22	64	110	70	91	45	100	68	90	55
23	66	135	80	92	33	100	64	110	60
24	60	110	65	100	28	100	64	90	50
25	68	105	85	110	36	100	70	90	60
26	60	100	70	115	20	75	56	90	50
27	74	130	60	89	40	50	70	140	70
28	64	135	75	104	43	100	72	120	80
29	60	120	75	84	45	100	60	100	70
30	68	100	70	108	35	100	64	105	75
31	60	130	85	116	39	100	68	120	60
32	65	130	75	85	31	100	62	100	60
33	54	110	80	76	35	100	56	100	60
34	80	130	80	115	20	10	80	120	80
35	65	105	60	100	27	100	65	110	60
36	60	110	70	100	39	100	60	100	60
37	60	110	70	96	40	75	64	115	40
38	72	105	70	110	43	100	80	95	70
39	68	125	70	120	35	100	60	110	80
40	52	130	80	100	35	100	52	110	65
41	56	100	60	100	35	100	64	85	60
42	60	155	75	100	33	100	60	100	60

43	64	140	75	80	40	50	64	140	70
44	70	110	70	100	35	100	64	100	60
45	56	130	60	80	33	100	60	110	50
46	64	130	50	80	35	30	64	120	70
47	68	130	90	80	31	100	58	120	75
48	64	130	85	112	37	100	68	120	80
49	60	100	75	92	40	50	70	105	70
50	54	110	80	76	35	100	56	100	60
51	56	162	71	72	33	100	58	115	70
52	60	110	70	84	35	30	62	100	60
53	74	140	90	100	35	100	58	110	70
54	64	115	75	92	35	100	60	105	70
55	68	110	80	100	31	100	76	110	70
56	72	130	90	104	35	100	80	100	60
57	60	120	80	92	45	100	60	105	65
58	56	100	60	92	35	100	70	100	60
59	72	130	90	76	35	100	64	120	80
60	60	120	70	108	40	75	60	107	59
61	72	95	65	104	35	100	68	90	60
62	68	120	75	120	29	100	64	120	65
63	75	145	72	106	35	100	68	120	80
64	52	126	76	88	37	100	56	130	70
65	68	135	80	96	35	100	72	115	65
Units									

Annex « G »

The parameters of the last day before, during and after the effort

Parameters / Subjects	Before the effort			During the effort			After the effort		
	HR	Systolic/BP	Diastolic/BP	HR/Max	Duration	Charge	HR	Systolic/BP	Diastolic/BP
1	68	100	70	110	60	75	70	100	60
2	68	100	70	100	85	75	80	100	50
3	64	110	70	116	60	75	64	100	70
4	68	100	70	90	55	75	70	90	60
5	62	120	70	112	40	75	60	120	70
6	58	100	60	99	60	75	60	100	60
7	68	120	80	110	35	75	64	120	80
8	54	130	65	90	60	75	60	110	70
9	70	130	80	70	50	75	75	120	75
10	64	110	70	102	45	75	64	110	70
11	59	140	75	110	45	75	58	130	70
12	57	125	70	100	55	75	60	110	60
13	72	120	90	120	40	75	68	115	60
14	72	120	75	96	60	75	60	100	60
15	80	124	76	100	50	50	64	100	60
16	60	120	70	120	50	75	64	110	60
17	80	95	60	100	20	75	86	100	65
18	68	120	80	100	60	75	72	100	50

19	68	110	60	112	60	75	76	100	65
20	71	120	80	91	50	75	73	105	70
21	60	105	70	99	45	75	60	110	60
22	60	95	60	92	60	75	68	115	70
23	52	130	80	80	35	75	62	130	80
24	64	115	70	100	50	75	60	100	70
25	60	110	80	104	40	75	60	95	70
26	68	100	70	108	40	75	60	100	80
27	78	120	70	85	40	30	73	110	70
28	68	120	70	92	50	50	68	125	75
29	60	120	80	80	70	75	60	130	80
30	60	110	70	108	50	75	64	100	70
31	64	110	70	104	50	75	60	120	65
32	64	140	80	80	50	75	72	120	75
33	58	120	70	86	35	75	58	122	70
34	74	125	80	56	40	10	72	120	80
35	76	137	73	100	50	75	60	105	70
36	60	105	73	112	45	75	64	110	80
37	68	120	80	84	55	75	56	130	80
38	68	110	70	104	25	75	64	110	70
39	64	120	80	100	45	75	52	100	70
40	52	124	64	92	50	75	53	100	70
41	56	100	65	90	50	75	64	100	60
42	56	140	70	100	35	75	64	130	70
43	64	150	70	88	45	50	68	140	70

44	48	90	60	80	50	75	56	90	60
45	56	135	65	84	50	75	60	125	60
46	68	120	60	84	35	75	60	110	60
47	64	130	80	92	40	75	68	120	80
48	64	130	80	92	45	75	60	100	60
49	64	115	75	80	35	50	64	115	70
50	58	120	70	86	35	75	58	125	70
51	56	145	80	96	50	75	52	120	70
52	68	110	70	84	25	30	68	110	70
53	64	125	70	100	45	75	72	110	70
54	60	110	80	112	50	50	72	110	70
55	64	110	80	100	40	75	64	110	80
56	72	110	70	96	40	75	67	120	80
57	60	110	70	84	50	75	64	95	60
58	82	105	70	98	25	75	92	120	70
59	72	120	80	104	45	75	60	110	80
60	56	140	80	104	35	75	64	120	50
61	62	104	60	105	45	75	60	90	60
62	60	130	80	100	40	100	64	115	65
63	76	110	80	104	50	75	68	110	75
64	70	125	80	78	50	75	65	95	54
65	60	120	70	100	40	75	70	110	70
units									

Mission Facilitation Document

الجمهورية الجزائرية الديمقراطية الشعبية
Ministère de l'Enseignement Supérieur et de la Recherche Scientifique
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-Université Abdelhamid Ibn Badis Mostaganem
Institut d'Education Physique et Sportive

جامعة عبد الحميد بن باديس – مستغانم
معهد التربية البدنية و الرياضية

ميدان: علوم و تقنيات الأنشطة البدنية و الرياضية — مستغانم: 2023/10/29

قسم: النشاط البدني المكيف

الرقم: 2023/10/703

الموضوع: طلب تسهيل مهمة

إلى السيد(ة): CENTRE NATIONAL DE MEDICINE DU SPORT

EHS - DR- MAOUCHE MOHAND AMOKRANE

CARDOIVASCULAIRE

يشرف السيد رئيس قسم النشاط البدني المكيف بمعهد التربية البدنية و الرياضية بجامعة مستغانم، أن يتقدم إلى سيادتكم المحترمة بهذا الطلب و المتمثل في السماح للطلبين :

- طه بو سعدة — مزداد 2003/04/06 — ب غرداية
- صحراوي عبد الرحمن — مزداد 2001/05/24 — ب سيق - معسكر

المسجلين في السنة الثالثة ليسانس نشاط البدني الرياضي والإعاقة للسنة الجامعية 2024/2023 وهذا لإجراء تربص تطبيقي بمؤسستكم و ذلك بغرض إعداد مذكرة تخرج لنيل شهادة الليسانس.

تقبلوا سيدي فائق عبارات الشكر و التقدير.

رئيس القسم
إمضاء: د. رفيق مدني

EHS Dr. MAOUCHE - M.A.
ex. C.N.M.S
16 NOV. 2023

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