How to Cite:
Khether, D. A. A., & Gorgees, S. H. (2022). A comparative study between two training aerobic units for intermittent and continuous effort in some blood and plasma volume variables. *International Journal of Health Sciences*, *6*(S5), 8350–8361. https://doi.org/10.53730/ijhs.v6nS5.11739

A comparative study between two training aerobic units for intermittent and continuous effort in some blood and plasma volume variables

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Abstract---Scientific research has a great importance in various fields, and the studies reached to results that were unforeseeable, especially in the field of sports training physiology, as the study of sports training physiology has a relationship in all sports disciplines on the one hand and its importance on health. Due to the breadth and depth of dealing with the physiology of sports in recent years, researchers have been able to obtain important physiological information and facts that contributed to the development of sports training so that it is appropriate to the ability of physical adaptation. These changes occur in cells and tissues, including aerobic and anaerobic change. The study aimed to: Identifying the differences between the two training aerobic units in some blood and plasma volume variables; tdentifying the differences in the dimensional values between the two training aerobic units in some blood and plasma volume variables. The researcher assumed: There are statistically significant differences in the differences between the two training aerobic units in some blood and plasma volume variables; there are statistically significant differences in the differences in the dimensional values between the two training aerobic units in some blood and plasma volume variables. The research sample consisted of after the researcher determined the research population in a deliberate manner with the players of the Nineveh Governorate team for the arena and field, which numbered (10) players. The category of applicants, which numbered (6) players was chosen from this community intentionally, that is, by (60%) of the research population. The researcher used the

following statistical means (Arithmetic Mean, Standard Deviation, (T-Test) For Related Samples, and Coefficient of Variation) and using the statistical package (SPSS) version (11.0) for the purpose of statistically processing the data. The researcher concluded: There are significant differences in the arithmetic averages between the two units of intermittent and continuous effort for the unit of intermittent effort in the blood variables; There are significant differences in the arithmetic averages between the two units of intermittent and continuous effort for the unit of intermittent effort in the volume of plasma; There are significant differences in the arithmetic averages between the two units of intermittent and continuous effort for the unit of intermittent effort in the variable fibrinogen. Recommended: Using units with different effort and for longer periods and for the same level of the sample under the current study; Comparisons between male and female players applying for the same variables; Conducting other studies on immunological variables.

***Keywords*---**blood and plasma, physiology of sports, training aerobic units.

1- Introducing the Search

1-1 Introduction and Importance of Research

Scientific research has a great importance in various fields, and the studies reached to results that were unforeseeable, especially in the field of sports training physiology, as the study of sports training physiology has a relationship in all sports disciplines on the one hand and its importance on health. The blood also consists of red and white blood cells and platelets. Red blood cells and white blood cells make up 40-45 of the blood's volume, while platelets make up less than 1% of the total blood volume. Red blood cells are responsible for transporting oxygen to the cells, while white blood cells are responsible for protecting the body from microbes, and their number is about 7000 white cells per cubic meter of blood (Baha Salama, 2008, 168-169).

There are studies discussed different aspects and approaches from the current study, including the study of (Wozinak. et al 2001) increase Plasma in humans after a single intense exercise protocol. The researcher used intense intermittent exercise to produce a 10-volume expansion of plasma within 24 hours and tested the hypothesis that photoelectric expansion is associated with an increase in plasma albumin content. The protocol consisted of 8 bouts of exercise for 4 minutes at 85 % max of o and uptake with recovery periods of 5 minutes from seizures concentrations PV, plasma of albumin and total protein (tp) and plasma osmolality were measured before and during exercise at 1, 2 and 24 hours of recovery from exercise. During recovery, pv decreased to 15% while remaining Plasma tp content and plasma albumin content At control levels at one hour of recovery, the plasma albumin content increased by (0.17 * 0.04) g/kg body weight, which represents the complete increase in tp content in plasma. The sample consisted of six healthy male volunteers aged between (17-20) all persons

who exercised regularly but did not participate in endurance training programs (Wozinak. Et al 2001, 245)

While another study indicated that acute physical exercises and repetitive exercise stimuli affect the metabolic balance of (Marius, et al, 2016) The aim of the study was to determine the plasma protein of trained individuals of two trained and untrained samples, where the trainee (n = 19 eet,) and the untrained (n = 17esd) were at rest and in response to some of endurance exercise (Marius,et al, 2016, 469).

While (Mil Med, 1998), whose study indicated alternatives in plasma volume and protein, the study's objective was impact of a continuous walk of 110 km length with a backpack carrying 20 kg on the plasma volume and intravascular protein content of Twenty – two healthy male volunteer sample aged between 19 and 20 years who were physically adapted to do hard exercise (Mil Med, 1998, 110). Accordingly, the importance of our research came in the study of blood plasma proteins and blood cells, due to their important functional role in the body, and since these responses are affected as a result of the regular practice of training. After reviewing many studies and researches that specialized in this field, and through the foregoing, it's clear to us that there are few studies that specialize in identifying the volume of plasma and its relationship to blood variables, and it is not known what the responses of the current research sample are, which the researcher will deal with as athletes in the future, to the knowledge of the researcher.

1-2 Research Problem

Through the researcher's review of scientific research, she noticed that there is a constant need to find the best ways and means to improve the level of aerobic functional performance for athletes, especially the effect on performance time and delay fatigue that accompanies aerobic physical activity, in which the respiratory and blood circulatory system plays a large and decisive role to know the impact of this on improving Aerobic work and blood, where its components play an important role.

1-3 Research Objectives

1) Recognizing the differences between the two training aerobic units in some blood and plasma volume variables.
2) Recognizing the differences in the dimensional values between the two training aerobic units in some blood and plasma volume variables

1-4 Research Hypothesis

1) There are statistically significant differences in the differences between the two training aerobic units in some blood and plasma volume variables.
2) There are statistically significant differences in the differences in the dimensional values between the two training aerobic units in some blood and plasma volume variables.

1-5 Research Areas

1) **The human field**: the research sample consists of (6) long-distance runners from the Mosul city team.
2) **Time field**: 2/27/2022 to 3/27/2022
3) **Spatial field**: The Mathematical Biomechanics Physiology Laboratory in the College of Basic Education.

2- Search procedures

1-2 Research Methodology

The researcher used the descriptive approach as it is the most appropriate approach to the nature of the problem to be studied and as it is the closest to solving problems in a practical way.

2-2 Research sample and Population

The research community included (10) players, who are the Nineveh Governorate team for medium and long distances for the category of applicants (**). As for the research sample, it included (6) long-distance players, 60% of the total number was chosen randomly. The researcher made sure to sign the individual sample to a written undertaking after they were briefed on the nature and course of the research experiment (Annex 2), and the coefficient of variation (**†) showed an acceptable homogeneity between the members of the research sample, and Table (1) shows some information about the research sample members, which It was obtained by means of a form for collecting information about the sample members (Annex 1).

Table (1)
It shows the statistical parameters of some specifications of the research sample

Pulse in Rest	Training Age	Age	weight	Length	Variables
68.6	2.6	22	67.34	175.4	Arithmetic mean
5.45	0.54	1.41	5.51	3.13	standard deviation
7.95	21.06	6.42	8.18	1.78	Variation coefficient

* The trainers were relied upon to determine the sample are:
- L. Dr. Abdullah Hassan Ali / President of Athletics Federation in Nineveh Governorate
- Trainer Fawzi Idriss Thanoun
- Trainer Bashar Shehab Ahmed
- Trainer Nashwan Adnan Alo

† If the value of the coefficient of variation is less than 30%, this indicates the homogeneity of the sample (Al-Tikriti and Al-Obaidi, 1999, 161).

2-3 Equipment and tools that used *) ‡**

- An electric Treadmill Trackmaster type rotating tape device, American origin.
- Medical Scale Detector, height and weight measuring device, American origin.
- A digital thermometer to measure the ocean temperature and the relative humidity of the ocean, a type (Delta trak), Chinese origin.
- Oximeter to measure the pulse during rest and effort
- Two (2) electronic manual stopwatches.
- One (1) laptop computer
- Medical instruments, including:
- Medical injections (5cc).
- Alcohol sterilizer.
- Medical Cotten.
- Plastic containers (Tips) for storing specimen samples
- Box case for blood preservation and transfusion
- Glass tubes (10cc).
- Plasma tubes (5cc).
- Medical tape.
- Elastic belt (Turnka) used to tie it on the upper arm when drawing blood.
- Analysis tools include:
- Centerfuge centrifuge.
- Elisa device, type (ELX 800), a company (Bio kit) of American origin.
- Number Analysis Kits.
- A device for measuring blood variables for examining a complete blood (complete blood picture) from Seac company, Italian origin.
- A Stago device to measure the protein fibrinogen laboratory
- A C311device from ((Roshn)) company to measure the proteins albumin and Clobin in the laboratory.

2-4 Data collection methods

The researcher used tests and measurements to collect data, which included the following:

Tests and Measurements for the Homogeneity of the Sample:

Body measurements**:**
Measurement of body length (cm) and weight (kg):

The height and weight of the research sample were measured using a device (measuring height and weight) type (Detecto). After turning on the device and set it back to zero, the player stands on the device barefoot and a member of the assistant work team moves the metal plate to touch his head. After installation, the indicator that represents the length of the player in centimeters is read, and write weight after the reading is settled on the electronic screen. The figure represents the weight in kilograms and to the nearest (200) g.

‡ A request was submitted to Deanship of College of Basic Education to use some equipment from the Physiology Laboratory of Physical Education Department (Appendix).

Physical exams:

Two different antenna units were identified as intermittent (intermittent) and continuous effort for the experiment of the current study, as follows:

Aerial Effort Unit:

The periodic aerobic effort was determined by taking advantage of the fourth region of the tables (1984,Fox), as the time was adopted from (4-5 D), and included working in it by two groups, and three repetitions for each group so that the time of one repetition was (5 D) and using a rest period (1:1/2) between iterations

((Fox, 1984, 214), thus determining the periodic aerobic stress test by running on the rotating tape device with two groups and a work period of (15 D) divided into three repetitions with positive rest periods of (2.5 D) between one repetition and another and negative rest between The two groups measured (5 min) and work intensity (50% - 65%) of the maximum pulse intensity, which ranged between (130 - 150) beats / minute, and the rotation speed of the rotating tape reached (10) km / h.

DC Effort Unit

Continuous aerobic effort includes running on Treadmill for (30 minutes) continuously without interruption with the same work intensity in the periodic air effort, which is (50% 65%) of the maximum pulse intensity, which ranged between (130-150) beats / minute and at a rotational speed of the device (10) km / h.

Points taken into account when performing the two units:

1. The tests of the two air effort units (periodical and continuous) were conducted at the same time and place.
2. The two tests were carried out at moderate temperatures ranging between (22-24 °C) and relative humidity (0 °C), which was controlled by the air-conditioning device (3 tons) located in the physiology and biomechanics laboratory in the College of Basic Education, where the two research experiments were applied.
3. Unifying the warm-up process in terms of content and timing
4. Giving a rest period of (7) days between the periodic aerobic effort test and the continuous aerobic effort in order to avoid any effect of the first test on the second test.
5. The research sample was informed not to eat any food or liquid substance, even water, for a period ranging between (10-12) hours before performing the two tests to control the normal plasma volume inside the body and based on the opinions of specialists in general and sports physiology who were interviewed (* §)

§ (*) Experts and specialists:

- Prof. Dr. Fadwa Khaled Tawfiq General Physiology, College of Veterinary Medicine
- Prof. Muhammad Tawfiq Othman, Physiology of Physical Training, College of Basic Educatio

2-5 Determine the two units of Effort:

The researcher prepared a questionnaire and presented it to the experts and specialists in the field of sports training and sports training physiology and it contains several times for previous research in the same field, where these times were different and represented by drawing tribal blood and direct withdrawal after the completion of the effort.

2-6 Determining the intensity of work with periodic and continuous air voltages:

The intensity of work was determined by the periodic and continuous air voltages of the research sample using the pulse indicator through the following procedures:

- Measuring the pulse rate of the research sample at rest
- Determining the maximum pulse rate for the individuals of the research sample using the following equation:
  (220 - age = maximum pulse rate)
- Determine the percentage of intensity used from the maximum pulse rate.
- After obtaining these values, the intensity of the air voltage was determined using the following equation:
  (maximum pulse rate - resting pulse rate) x percentage of intensity to be worked on (%) + resting heart rate (Nieman, 2002, 243).

The intensity of the periodic and continuous effort of the research sample ranged between (130-150) beats / minute.

2-7 Functional measurements and tests

Procedures for preparing blood samples

The procedures for preparing blood samples for the purpose of measuring the blood variables under study included the following steps:

- Venous blood samples were collected using injection (5 cm^3) in size.
- The blood samples were saved in a box case and delivered to the laboratory
- The blood was separated using a centrifuge at a speed of (3000) revolutions per minute for (20 minutes) to separate the plasma from the cells.
- The plasma obtained from the apheresis process was withdrawn by centrifugation using a small pipette and (microbaby) device.

Blood protein analysis:

The Stago device was used to measure blood and plasma variables in the laboratory, and the C311 device from Roshn Company was used to measure the Albumin and Clobin proteins in the laboratory (**) using the kit type (Cobas, American origin).

- Prof. Dr. Hadeel Ahmed Al-Faslujah, College of Science / Department of Life Sciences

** The blood variables under study were analyzed in Al-Kawthar and Radwan Al-Jamas laboratories.

2-8 Main experience:

The two research experiments included the entry of all the sample members into the laboratory after changing their clothes and sitting in it for (15 d) before making the tribal measurements to ensure that the research sample was exposed to the same experimental conditions. (22-24 m 5) and for the purpose of achieving the objectives of the research, the researcher conducted the test on the sample members on Sunday and Monday (6-7/3/2022) for the periodic training, and on Sunday (13/3/2022) for the continuous training at nine o'clock in the morning. The two experiments included measurements in the conditions of rest, after exertion and recovery periods, which were as follows:

Measurements in comfort conditions:

- Measurement of body temperature.
- A venous blood sample was taken from the athlete after sitting in a comfortable position from the elbow fold, Capital fossa, by the specialized biologist (*††) with a value of (5CC).
- A warm-up was conducted for the player for (5 minutes) by climbing on the rotating tape device and walking or Jog on the machine at a speed (5 km / h).
- Give a rest period of no more than (5) minutes.
- Starting the test after calibrating the rotating tape device at a speed of (10) km / h and an incline of.(0)
- When the player starts running, the timer starts stopwatch with the Oximeter placed in the player's finger and continuously to know the value of the pulse.

Measurement directly after the effort:

- Venous blood was drawn from the sample individuals from the elbow fold (Capital fossa) (5 CC).

3-9 Statistical processing

The following statistical methods were used
- Arithmetic mean.
- Standard deviation.
- A t-test for the linked samples.
- Coefficient of variation. (Al-Tikriti and Al-Obaidi, 1999, 161).

The data was processed using the statistical package (SPSS 17), and the extracted values were processed using the program (ExCEL).

†† Biologist Muhammad Ibrahim Daoud / Bachelor of Biological Sciences / Al-Kawthar Laboratory for Pathological Analyzes.

3- Presentation, discussion and analysis of the research results

3-1 Show results

Table (2)
It shows the arithmetic means, standard deviations, and the amount of probability and significance of the research variables before the effort

significant	probability amount	(T) Value	Continues Effort		Intermittent Effort		measuring unit	Statistical features / Variables
			standard deviation	Arithmetic mean	standard deviation	Arithmetic mean		
Non-significant	0,198	1,483	2,31	51,81	1,75	53,21	g/dl	plasma volume
Non-significant	0,521	0,690	0,51	6,01	0,35	5,78	10^3/ µL	WBC
Non-significant	0,607	0,549	0,17	5,27	0,23	5,22	10^6/ µL	RBC
Non-significant	0,984	0,022	30,19	210,50	52,00	210,83	10^3/ µL	PLT

The error percentage >0,05

1- It shows from Table (2) that there is no significant difference in the research variables under the current study, which are (plasma volume, WBC, RBC, PLT), where the calculated (T) values were (1.483, 0.690, 0.549, 0.022) while the values of (T) were calculated respectively (1.483, 0.690, 0.549, 0.022) The probability, respectively (0.198, 0.521, 0.607, 0.984)
2- There are differences in the arithmetic averages between the unit of intermittent effort and the unit of continuous effort in favor of the intermittent in the variables (plasma volume, red blood cells, and blood disks)
3 -There are differences in the arithmetic averages between the unit of constant effort and the unit of intermittent effort and in favor of the constant effort in the variable (white blood cells)

The researcher attributes these differences to the intermittent effort, which is two groups performed by the sample on the rotating tape device, in which the sample lost a not small amount of sweat fluid during the performance of the physical effort on the rotating tape at a speed of (10 km) per hour in addition to the positive rest, which was exerted The player exerts effort despite the low intensity of the load, as the body needs energy even in the case of returning to the normal situation or dropping the pregnancy by half. All this made the player's body lose part of the sweat fluid, which in turn will affect the volume of blood in the body as a proportion and proportion between the volume of plasma and cells. Most studies have focused on the effect of sports training on red blood cells and hemoglobin due to its importance for endurance. While there is no focus on the effect of regular sports training on white cells, this may be due to the association of red balls and hemoglobin with the element of endurance due to their role in transporting oxygen to the working muscles, but the role of white cells is no less important for the athlete due to the important role they play in disease resistance, which The player often gets infected during the competition season and thus loses his fitness and decreases his athletic level. Few studies have focused on the effect of regular sports training on the white balls and on immunity.

(Johar, 2002) has note an increase in plasma volume to a degree that increases relative to red balls under the influence of sports training and as a result the percentage of hemoglobin concentration in the blood decreases as a result of the increase in plasma volume in relation to hemoglobin and not as a result of hemoglobin deficiency. Rushing to diagnose this case before confirming the occurrence of a functional increase in the blood plasma in relation to red blood cells. This study is different from the current study in terms of plasma volume (Johar, 2002, 49).

(Salama 1994) believes that sports training leads to changes in the blood like the rest of the other organs and systems of the body, and the degree of these changes is linked to many factors, the most important of which are the training period and type, and accordingly the effect of training is either permanent or temporary, and includes changes that occur for each Blood compounds as well as blood volume and condition (Salama, 1994, 255).

The current study agrees with the study (Taha and Khalil 2003) that concentration of blood associated with physical activity often occurs as a result of a decrease in plasma volume, and this means that blood cells and protein, which represent the largest part of the blood volume, become more concentrated in the blood, and the concentration of blood in this case leads to Increasing the concentration of red blood cells and this increase may reach 25%, which increases the hematocrit value and may reach 50% without an equal increase in the number or contents of red blood cells in the blood, and an increase in the concentration of red blood cells leads to an increase in the oxygen capacity of the blood. (Taha and Khalil, 2003, 49).

(Salama 1994) confirms that the continuation of physical effort and sweat secretion helps to transfer part of the plasma fluid to the intercellular fluid, i.e. intercellular fluid, and this in turn leads to an increase in blood viscosity from the resting state and the blood becomes more dense (Salama, 1994, 345).

These results are also consistent with the results of the study of Thilberg at et (2000), which showed a change in the rates of certain factors that help in the clotting process after endurance exercises and the accompanying decrease in the rates of platelet aggregation, which indicates early activation of the clot during the exercise period (Thilberg at et al., 2000, 383 and also agree with the results of Boninn (2002) study, where the most important results showed a short time relative to thromboplastin to a large degree against a slight increase in the rates of paired prothrombin, and fibrin fibers increased by 15 times than normal immediately after exercise and the increase continued during all the following measurements and also increased intensity during all dimensional measurements, and this study confirmed that short-term, high-performance exercise leads to a tendency to increase blood clotting more than the state of normal equilibrium during exercise. Transporting oxygen from the lungs to tissues and delivering metabolic carbon dioxide to the lungs for exhalation, and hemoglobin also contributes to the blood's ability to Buffering. The release of Adenosine triphosphate (ATP) from red blood cells contributes to vasodilation and improved blood flow to working muscles. These functions also require adequate amounts of red blood cells in the circulation. Trained athletes, especially in

endurance sports, suffer; This is because athletes actually have an increased total mass of red blood cells and hemoglobin in their circulation compared to sedentary individuals, and the slight decrease by training is caused by an increase in plasma volume. The mechanisms that increase total red blood cell mass by training are also not fully understood, although erythropoiesis stimulation can reduce red blood cell mass by intravascular hemolysis mainly of red blood cells, which occurs due to Mechanical disruption, when red blood cells pass through capillaries in contracting muscles, and by compression of red cells for example in the sole of the foot during running or in the palm of the hand when lifting weights, these alterations together reduce the average lifespan of circulating red blood cells in trained athletes These younger red cells are characterized by improved oxygen release and deformation, both of which also improve tissue oxygenation during exercise, in the sole of the foot during running or in the palm of the hand during weightlifting. The primary role of red blood cells during exercise The primary role of red blood cells is to transport respiratory gases, and in the lung oxygen diffuses through the alveolar septum from the inspiratory air to the blood, where the majority bind to hemoglobin, a process called oxygenation, and hemoglobin is also contained in blood cells red, which is distributed by the cardiovascular system, delivering oxygen to the ocean (Boninn, 2022, 495)

4. Conclusions and recommendations

4.1 Conclusions

- There are significant differences in the arithmetic averages between the two units of intermittent and continuous effort and in favor of the unit of intermittent effort in the blood variables (WBC, RBC, PLT)
- There are significant differences in the arithmetic averages between the two units of intermittent and continuous voltage and in favor of the unit of intermittent voltage in the volume of plasma

4.2 Recommendations

- Using units with different effort and for longer periods and for the same level of the sample under the current study
- Comparisons between male and female players applying for the same variables
- Conducting other studies on immunological variables

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