



The effect of CrossFit training on the level of blood lipids among participants in fitness halls (Gym) in Ar-Ramadi City

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Abstract

The study aimed to identify the effect of CrossFit training on the level of total cholesterol (TC), good cholesterol (high-density lipoproteins-HDL), and bad cholesterol (low-density lipoproteins-LDL) and triglycerides (TG) in the blood of participants in fitness halls in Ar-Ramadi city. The study was conducted on (7) athletes who train to gain a slim body and good shape while attending regularly throughout the week. Thus, the researcher assumed that CrossFit training would reduce the level of body fat in the research sample. Moreover, the researcher used the experimental method for its suitability to the nature of his research problem, therefore, the researcher concluded that CrossFit training led to a reduction in the percentage of fat in the variables under study, and recommended the adoption of CrossFit training to reduce the level of body fat, especially bad fats when preparing the trainees physically and physiologically.

Keywords: crossfit training, blood lipids, halls (GYM)

Introduction

The modern scientific development taking place in the sports and physical fields has revealed new and limitless horizons in these sciences, including the science that links physiology with sports training that studies the effects of external training load on the adaptation of the functional organs of the human body, that's one of the reason why many countries have taken care of sports as a main source of health for their people and have opened the doors wide for these individuals to practice their favorite sports by providing gyms, sports fields and stadiums to practice sports that are compatible with their physical level and the ability of their functional organs, therefore, this interest in the physical and physiological aspect led to the emergence of modern training methods that witnessed a great demand from both genders and to move away from traditional methods by creating exercises based on excitement and suspense in which the trainees make a high effort without taking in thinking about the fatigue that may accompany these exercises to increase the efficiency of vital body systems which these exercises are used to satisfy the passion, tendencies and needs of their practitioners, and this is what CrossFit training contains various physical exercises that stimulate most of the body muscles when practicing them and aim to get rid of the increased accumulation of fat in the body, as well as increase the general physical fitness that makes an individual possess a strong and shaped athletic body through which he can practice his life naturally and is capable of practicing other sports activities appropriately, as "the idea of CrossFit training lies in integrating resistance training of the development of muscular strength with endurance training that is included in the aerobic energy production system, which leads to an increase in the functional capacity of the heart and respiratory system, the exercises of this type of training gives us Physical and functional adaptations that are related to both strength and cardiorespiratory functions and also increase the rate of energy expended during physical efforts"⁽¹⁾. This helps the body get rid of the extra fat and calories that the body gains from eating large quantities of food over the body's needs. The importance of the research lies in being one of the few studies that dealt with the effect of CrossFit training on reducing body fat among participants in the fitness halls, as well as studying the effect of this training approach physically and physiologically on the organs of the vital research sample bodies.

1. Research problem

Through the researcher's experience as an athletics trainer and a monitor of fitness hall training, as well as his knowledge of many recent studies in physiology and sports training, he found that the trainers of those fitness halls rely on traditional training curricula that do not provoke the trainees' desire to perform their exercises in an integral manner because they are not compatible with their physical and physiological abilities, and with the development of methods and styles of sports training that increase the fitness of trainees, it has become necessary to find appropriate methods to get rid of the effects of excess weight, which is increasing due to the lack of movement of many people especially those who did not practice much walking, which is one of the simplest things through which we can get rid of Increasing calories resulting from eating more food than the body needs and spending it as energy instead of storing it in the body as fat, Therefore, the researcher chose to

study this problem by developing a training curriculum according to the CrossFit training method, which may lead to a reduction in the level of body fat in the research sample to get rid of the disadvantages of this excess fat on the functional organs of the body, as well as the sample possess strong muscles and slim bodies with physical fitness commensurate and with the requirements of their daily lives and take advantage of this fitness in the practice of sports activities that they wish to adopt naturally.

2. Research Aims:

Preparing exercises according to the CrossFit training method for the research sample.

Identifying the effect of CrossFit training on the level of good cholesterol (HDL), bad cholesterol (LDL), triglycerides (TG) and total cholesterol (TC) in the blood of the research sample.

3. Research Hypotheses

There are statistically significant differences between the pre and post-tests in the level of good cholesterol (HDL), bad cholesterol (LDL), triglycerides (TG) and total cholesterol (TC) in the blood of the research sample.

4. Fields of Research

1. **Human field:** A sample of participants in fitness halls in the city of Ramadi.

2. **Time domain:** For the period from 15/10/2021 to 1/2/2022.

3. **Spatial domain:** (4T) fitness hall in Ar-Ramadi city.

Theoretical studies

1. CrossFit training

CrossFit training is one of the modern training methods that develop the elements of physical fitness and capabilities of the trainees through exercises that include contractions of various muscle groups of different parts of the body, the majority of these exercises depend on various life movements such as running, jumping, resistance exercises, cycling, swimming and other movements that the trainees perform in their daily lives, thus "CrossFit training includes routine functional movements that a person practices in his daily life and performs them intensively, as the human body is designed to adapt these movements naturally while using all the muscles, such as lifting weights in different ways, jumping, jogging, or dragging the weight with the rope, which would raise some aerobic and anaerobic physiological variables"^[2]. CrossFit training exercises are characterized by diversity and the passion to apply them in an integral manner, especially if they are performed in groups, which inspires competition in the hearts of the trainees, which makes them perform exercises with joy and pleasure without thinking about the fatigue that accompanies performing these exercises due to their important role in satisfying the trainees and thus increasing the efficiency of their functional organs such as the respiratory system, the muscular system, and the circulatory system, and it increases the tolerance of these vital organs to the exercises that are included in the aerobic and anaerobic energy production systems, in this type of training, "the development of functional devices takes place gradually until the trainee reaches a good level of physical fitness because he believes in the strength and potential energy that he stores and that he is able to extract it, as this type of training depends on the repetition of the movement until his working functional organs adapt to their performance in a smooth manner, which increases the athlete's motivation and positive spirit of challenge"^[3]. Therefore, CrossFit training is of great importance in the physiological, physical and psychological aspects through group training and competition when performing its exercises. As "CrossFit training is concerned with main aspects starting with safety, physical effectiveness and efficiency in fitness programs, as its aerobic training in all its forms improves the efficiency of the circulatory and respiratory systems and increases the maximum rate of oxygen consumption (VO₂max), which increases the efficiency of performance in endurance activities"^[4]. Also, CrossFit training leads directly to the improvement of anaerobic capabilities by relying on different exercises that do not need a lot of supplements because its exercises reflect lifestyle movements more than they are sports exercises, so they are safe for the trainees and reduce their level of injuries because "CrossFit training depends on doing movements that participate in the performance of various muscle groups, with the necessity of continuity in performance of relatively high intensity and making the maximum effort in the least possible time by relying on the various life movements of the different parts of the body"^[5].

2. Blood Lipids

Fat is one of the basic and necessary materials needed by the athlete's body due to its important role in producing the energy needed to perform physical efforts, especially in sports events that are characterized by the length of their performance, such as team games and endurance sports in general, and sports play an important role in maintaining the normal level of body fat, in any way, there are many types of fats found in human blood and others stored in adipose tissue cells, but the most famous of these fats associated with sports activity and directly affected by physical exertion are total cholesterol (TC) and triglycerides (TG), high-density lipoprotein, which is called the good cholesterol (HDL), and low-density lipoprotein, which is called the bad cholesterol (LDL) because it is associated with early coronary heart diseases and has a period of disappearance from the circulation ranging from (2-5) days, Cholesterol is one of the most prominent blood fats and one of the basic and necessary materials for building many cells of the functional organs of the human body, as "cholesterol is used in the production of some hormones, vitamin D and bile acids that help in the digestion of fats, It also enters the

composition of the plasma membranes that preserve cells and also enters the composition of lipoproteins in the blood. The concentration of cholesterol increases in the liver, which is the main place for the production and storage of good and bad cholesterol, which are also found in blood plasma lipoproteins, though "cholesterol is a double-edged sword, as good cholesterol plays a positive role in building body cells, brain functions, and the formation of gender hormones, while bad cholesterol is one of the main factors for atherosclerosis and heart-attacks"[6]. In addition, good cholesterol and bad cholesterol have an inverse relationship that depends on their movement within the body, thus, "the movement of bad cholesterol from the liver to the arteries, and in case of an increase in its concentration in the blood, it unites with the inner layer of the arteries (intima) to accumulate its quantities over time, which leads to blockage of the arteries, causing a heart-attack. as for good cholesterol, its movement from the arteries to the liver, thus contributing to the disposal of bad cholesterol" [7]. Scientifically, "good cholesterol (HDL) has a lifespan of five days, and its molecule consists of protein (55%), phospholipids (24%), cholesterol esters (15%), triglycerides (4%) and cholesterol (2%), and the importance of this type of cholesterol plays an important role in transporting bad cholesterol from cells and arteries to the liver to be eliminated in the form of a yellow substance. While the bad cholesterol (LDL) cholesterol molecule consists of cholesterol ester (39%), protein (23%), phospholipids (20%), triglycerides (10%) and cholesterol (8%)" [8]. As for triglycerides, it is a type of fat found in the blood, as "most of the fats are in the form of triglycerides stored in adipose tissue, but a small percentage of them are present in the blood, thus high levels of triglycerides in the blood do not lead to atherosclerosis, But the cholesterol contained in these triglycerides molecules is the reason why a person is exposed to this disease, especially when the concentration of triglycerides increases above the normal limit, and this increase may contribute to coronary heart disease" [9].

Research methodology and field procedures

1. Research methodology

The researcher used the experimental method by designing one group with two tests, pre and post-tests, for its suitability to the nature of the research problem.

2. Research Sample

The research sample was tested deliberately, and it consisted of (7) individuals participating in the fitness halls in Ar-Ramadi city. Table (1) shows the homogeneity of age and the variables under study.

Table 1: Shows the homogeneity of the research sample

Variables	Measuring unit	Mean	Standard deviation	Median	Kurtosis*
Age	Year	30.571	2.760	29	1.707
HDL	mg/dl	41.69	1.081	41.37	0.888
LDL	mg/dl	65.574	1.685	65.630	0.100-
TG	mg/dl	75.865	2.422	75.510	0.440
TC	mg/dl	181.01	1.216	180.42	1.455

*The distribution is moderated if the values of kurtosis are less than (± 3)

3. Pre-Tests

Pre-tests were carried out on the research sample on (18/10/2021) in the Al-Surour laboratory hall for medical analyzes, as the percentage of fats in the blood [(TC), (HDL), (LDL), (TG)] was measured by using (FUJIFILM DRI-CHEM NX500i) device, which is based on Dry Chemistry Analyzer. This device was made by the Thai company (FUJIFILM), a pioneer in electronic industries, which means high accuracy in performance and lower cost of maintenance, the device is easy to control because it contains: An easy-to-use touch screen, does not require pretreatment of samples and does not require a large amount of blood serum, as it suffices with (10) microliters to measure the level of all fats in the blood, as well as controls the dilution automatically and does not need additional materials, and minimize the risk of biological hazard, and this device contains a serum cartridge, a plastic cone tube, and FUJI DRI-CHEM Slides. The lipid percentage is measured after the research sample had fastened of food and drink for (12) hours, then by withdrawing (1) ml of blood and placing it in a tube and placing the tube in a centrifuge to separate the serum from the blood, then (10) microliters of the serum are withdrawn and placed inside the cartridge designated for the serum and inserted into the device, and a (plastic cone tube) is placed near the serum cartridge inside the device and (FUJI DRI-CHEM Slides) for the tests under study [(TC), (HDL), (TG)] are placed above each other in their designated place inside the device, after that, we enter the name of the sample from the control screen and press (Start), and the results will appear within (5-10) minutes on the device's control screen, as it can be printed directly on the device's small printer inside it, or transferred to a computer to be printed on a larger sheet of paper. The level of (LDL) in the blood is calculated by the following equation:

$$VLDL = TG / 5$$

$$LDL = \text{Total Cholesterol} - HDL - VLDL$$

4. Main experience

The researcher prepared exercises according to the CrossFit training method, based on his field and professional experience, and access to Arab and foreign sources related to the current study. The intensity of those exercises ranged between (55% - 70%) for aerobic exercises and the intensity ranged between (60% - 75%) of the maximum ability of the research sample for anaerobic exercises, however, the work was done according to the progression standard by raising the training load gradually, as the training curriculum started with the lowest intensity adopted by the researcher and then increased by (5%) every two weeks, in addition, The researcher took into account the physical and physiological level of the capabilities of the research sample, thus, the exercises of this training curriculum were limited to medium intensity in most of its training units so that the performance of the sample continues for a longer period to reach the metabolism of fats that need the continuous physical effort of low or medium intensity so that the body can metabolize it to produce energy. The research sample started by applying the exercises of the suggested training curriculum on (20/10/2021), and the duration of the implementation of the training units took (8) weeks, with three training units per week, thus, the number of units reached (24) training units that depended on the skill of running continuously for (15) minutes on the treadmill at the end of each training unit to develop aerobic capability, and the training curriculum also included strength and speed exercises of medium intensity to develop the muscular system and improve anaerobic ability, which the research sample benefits from in performing the exercises of the training curriculum appropriately, though, speed and muscle strength training included performing exercises with relatively many repetitions due to the low intensity of the training load, among these exercises is placing the barbell on the shoulders to perform various exercises, including performing the deep-knee movement and then returning to the original position, raising the hands up and lowering them, performing the skill of deep-knee while jumping up when getting up, the exercise of raising the barbell above the head with the movement of the legs forward and backward alternately, the exercise of bending and extending the arms on the bar, depending on the weight of the body, ordinary rope exercises, especially jumping on the rope, raising the arms holding two thick ropes and then lowering them alternately as well, rubber rope exercises, jumping exercise with both legs on a box height (20) cm, and fitness balls throwing exercises with a weight of (3) kg. As for the speed exercises, they included exercises to perform the running skill according to the approved intensity for distances ranging between (20-50) meters, with repetitions interspersed with relatively few rest times.

5. Post Tests

The post-tests were carried out in the same way as the Pre-tests, as the researcher took the required measurements on (21/ 12/ 2021).

6. Statistical Means ^[10]

Mean, median, standard deviation, Kurtosis, t-test.

Presentation, analysis and discussion of the results:

1. Presentation and analysis of the results

Table 2: Statistical treatments for the pre and post-test of the research variables

Variables	Pre-test		Post-test		X Variance	S Variance	T-test Cal.	Results
	X	S	X	S				
HDL	41.69	1.081	49.08	0.930	7.38	0.276	26.739	Significant
LDL	65.574	1.685	58.885	1.067	6.688	0.394	16.974	Significant
TG	75.865	2.422	65.511	3.672	10.244	0.572	17.909	Significant
TC	181.01	1.216	161.66	2.323	19.347	0.626	30.906	Significant

The results of Table (2) indicate the pre and post measurements of the research variables [good cholesterol (HDL), bad cholesterol (LDL), triglycerides (TG), total cholesterol (TC)] various differences were recorded between the pre and post measurements, which amounted to (7.38, 6.688, 10,244, and 19.347), respectively, while the deviations of those differences were (0.276, 0.394, 0.572, 0.626), respectively, thus, the calculated T-test value for the search variables was (26.739, 16,974, 17.909, 30,906), respectively, When comparing it with the tabular score of (3.143) at the significance level (0.01) and the degree of freedom (7 - 1 = 6) to obtain the significance of the differences between the pre and post-test, it was found that the differences were significant in favor of the posttest because the calculated (T) values are greater than their tabular value for all variables, The proportion of good cholesterol (HDL) in the blood increased after the implementation of the research sample for CrossFit training exercises, while the proportion of other fats [bad cholesterol (LDL), triglycerides (TG), total cholesterol (TC)], whose increase in their concentration in the blood negatively affects the Functional organs of the athlete's body, which indicates a clear improvement in the proportions of all fat variables under study.

2. Discussion of the results

The researcher attributes the significant differences that occurred in the research sample in the level of fat under study in the blood between the pre and post-test in favor of the post-test to the exercises prepared by the researcher according to the CrossFit training method, which varied between exercises of anaerobic energy production system and exercises of the aerobic energy production system, the researcher believes that the direct reason for this significant differences for all fat variables is due to the nature of the CrossFit training exercises that each training unit contained according to the two energy production systems. The exercises of the anaerobic system included strength and speed exercises and the capabilities associated with these two physical elements such as explosive power, speed-characterized strength, the endurance of force and speed, whose training intensity reached (75%) of the maximum capacity of the research sample and the use of resistances such as normal and rubber ropes, fitness balls, weights, running for relatively short distances, and others. Which had a significant impact on increasing the metabolism of ready-made materials such as glucose, glycogen and carbohydrates to produce the energy needed to perform these exercises, this led to the readiness of body tissues and cells to burn calories resulting from metabolic reactions to produce energy in subsequent exercises, especially those that require relatively long periods. "The combined exercises of the two energy production systems burn between (700-1000) calories per hour and burn (1000-2000) calories per week, and these calories lost are sufficient to get rid of excess blood fats and some of the fats stored in the cells of the body, and prevent an increase in body weight by (3%)"^[11]. However, the exercises that are part of the aerobic energy production system represented by running strongly till reached (70%) of the maximum capacity of the research sample continuously for (15) minutes at the end of the main part of each training unit, which led to the burning of other nutrients in the blood or stored in Cells, especially fats represented by all types of cholesterol and triglycerides, to be used in the production of the large energy needed by the athlete's body to perform these continuous exercises appropriately, this does not only serve athletes, but also people who have problems with the heart and arteries, as "regular aerobic physical activity lowers the level of bad cholesterol (LDL) and raises the level of good cholesterol (HDL) in the blood, and aerobic exercise acts as a preventive aspect for patients, those at risk of developing cardiovascular disease resulting from an excess of bad fats in the body" ^[12]. Therefore, CrossFit training exercises in general affected the level of fats in the blood of the research sample, especially when these exercises are accompanied by eating a diet free of saturated fats, because "athletic exercises that work according to both energy production systems and avoiding eating saturated fats in large quantities leads to an increase in good cholesterol and reduces the level of bad cholesterol in the blood (LDL) by (-11.5%) and triglycerides by (-4.41%) and total cholesterol by (-10.79%)" ^[13]. This is what happened to the research sample when they performed CrossFit training exercises, which demonstrated the results of an increase in the level of good cholesterol (HDL) and a decrease in the percentage of other fats (LDL, TG, TC), whose increase in the blood affects the functioning of the functional organs of the athlete's body, whether during training or on health In general, it was found that "there is a noticeable effect on the level of body fat and its composition among athletes who perform exercises and physical effort according to the CrossFit training method"^[14]. From the above, the researcher sees that the continuity in performing the exercises and maintaining the rhythm of their performance by spreading the familiarity and competition and the change in the quality with no rely on one type of exercise increased the morale of the sample to perform those exercises with joy and happiness without thinking about the state of natural fatigue required and this leads to the occurrence of adaptations necessary for the functional organs of the body, as well as getting rid of bad fats in the body and calories more than the body's needs due to its use in the production of energy necessary to perform the exercises of the training unit integrally.

Conclusions and Recommendations

1. Conclusions

CrossFit training led to an increase in the good cholesterol (HDL) in the blood of the research sample.

CrossFit training led to a positive effect on total cholesterol (TC) and bad cholesterol (LDL) and a decrease in their percentage in the blood of the research sample.

CrossFit training led to a positive effect on triglycerides (TG) and a decrease in its percentage in the blood of the research sample.

2. Recommendations

Using the exercises prepared by the researcher according to the CrossFit training method when working to increase the proportion of good cholesterol (HDL).

Using the exercises prepared by the researcher according to the CrossFit training method when working to reduce body fat percentage (LDL, TC, TG).

Sports trainers and fitness hall trainers must monitor the level of body fat because of its role in negatively affecting the general health and functional organs of the athletes.

Conducting research to study the effect of the CrossFit training method on physiological variables other than the variables under study.

References

1. Glassman Grej. Understanding Crossfit. Crossfit Journal, U.S.A, 2007, 56.
2. Stoddard Fh. What is the Cross Fit. J Strength Cond Res,2011:28(6):P713.

3. Smith et al. Crossfit based high-intensity power training improves maximal aerobic fitness and body composition. *J Strength Cond Res* 27(11), P3164.
4. Gerhat D Haden. A Comparison of Crossfit Training to Traditional Anaerobic Resistance Training Terms of Fitness Domains Representative of Overall Athletic Performance. University of Pmeylvania, august, Indiana, 2013.
5. Walker Brad. The anatomy of sports injuries, North Atlantic Book, USA, 2007.
6. Levers K. et al. Effects of Exercise and Diet-induced Weight Loss on markers of Inflammation 1 : Impact on Body Composition and markers of Health and Fitness. *Journal of the International Society of Sports Nutrition*,2013;10(1):15.
7. Ana Claudia et al. Effects of Workplace Based Exercises on the Lipid Profile, Systemic Blood Pressure, and Body Fat of Female Workers. *Journal of Exercise Physiology Online*,2012:158(3):1098.
8. Park D, Ransone J. Effects of Sub Maximal Exercise on High – Denisty Lipoprotein Cholesterol Sub fractions. *International Journal of Sport Medicine*. Vo (124), P 248.
9. Michael J Ormsbee. et al. The effects of multi-ingredient dietary supplement on body composition, adipokines, blood lipids, and metabolic health in overweight and obese men and women. *Journal of the International Society of Sports Nutrition*.
10. Davis CS. Statistical methods for the analysis of repeated measurements. (No. 04; QA278, D38.). New York: Springer, 2002.
11. Donnelley J et al. Appropriate intervention strategies for weight loss and prevention of weight regain for adults. *Medicine and Science in Sport and Exercise*,2009:19:462.
12. Sarika et al. The Effects of Aerobic Versus Resistance Training on Cardiovascular Fitness in Obese Sedentary Females. *Asian Journal of Sports Medicine*,2010:1(4):179.
13. Sunil P. et al. The Effect of regular Sports Training of Different Mode on Serum Lipid Profile of Indian Athletes. *Medicinal Sportive, Med Sport*,2012:16(4):156.
14. Urbina Stacie, Sara Hayward. Human Performance. University of mary Hardin. *Journal of International Society of Sports Nutrition*. College street, 2013, 28.