

THE EFFECT OF EXERCISES IN THE STYLE OF ISCHEMIA AND HYPEREMIA TO REHABILITATE AND TREAT THE INVERTED SPRAIN INJURY OF THE ANKLE JOINT OF THE ANKLE JOINT ACCORDING TO THE ENZYME (CPK) AND GROWTH HORMONE (GH) FOR INDIVIDUAL SPORTS ATHLETES

Wafaa Sabah Mohammed Al-Khafaji*, Suadad Ibrahim Suhail Al- Kinani, Fatimah Hameed Kzar Al-Masoodi

College of Physical Education and Sports Sciences, University of Baghdad, Iraq

Abstract

The purpose of this paper is to identifying the effect of exercises in the style of ischemia and hyperemia in the treatment and rehabilitation of the inverted sprain of the ankle joint according to the enzyme (cpk) and growth hormone (GH) for individual sports athletes. For the sports season (2021-2022), as the number reached (8) injured, they were distributed among the games (2) gymnast players, (3) swimmers, (2) runners, and (1) tennis player. The researchers used the compression method to achieve the condition of ischemia and hyperemia, as this method is done by preventing the arterial blood from reaching the working muscles in the lower limb in the case of (ischemia) and then removing the compression method to turn it into the perfusion phase (hyperemia), by preparing therapeutic rehabilitation exercises accompanying this condition for a period of (6) weeks and at the rate of (3) therapeutic rehabilitation units per week, as the time of using the compressive method ranged from (3-5) minutes during the main section, and pre, intermediate and post tests were conducted for their suitability to the nature of the problem, the researchers concluded that the exercises in the style of ischemia and hyperemia A positive effect in the treatment and rehabilitation of inverted sprains of the ankle joint for individual sports athletes, as there is a clear increase in the enzyme (cpk) and a clear decrease in growth hormone (GH). Growth (GH) within the rehabilitation curricula and relying on it for its significant role in the treatment of injury.

Keywords: Ischemia. Hyperemia. CPK enzyme. Growth hormone (GH)

Introduction

Ankle joint injury is one of the most common injuries, and it may reach 85% of all joint injuries, when performing any skill for any sport, especially individual games, it may lead to a sudden movement that may cause injury or as a result of many and varied reasons from us The burden resulting from the training process and placed on the shoulders of the athlete, which causes fatigue and stress and thus the occurrence of overloads and then the occurrence of injury, as well as rapid movement, jumping, landing, friction with a colleague or competitor. All these factors may generate injury to the athlete, including injury the inverted sprain of the ankle joint, which is one of the common injuries among athletes, especially in individual sports (gymnastics, swimming, running, and tennis), the subject of the study. In order to treat an athlete with a sprained ankle joint, he needs a rehabilitative

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*Corresponding Author: Wafaa Sabah Mohammed Al-Khafaji, College of Physical Education and Sports Sciences, University of Baghdad, Iraq

Correo-e: wafaa.kraidi@cope.uobaghdad.edu.iq

approach to speed up the return to his normal state before the injury occurred and to return to the stadiums in an appropriate manner. The method and method of treatment differs according to the type and severity of the injury.

And through the experience of the researchers in the field of physiology of training and rehabilitation of injuries, they found that some workers in the field of training and rehabilitation were still not aware of everything new in the field of rehabilitation of injuries using traditional methods, so the researchers decided to use one of the new and developed methods for this purpose, which is hoped that Through which we obtain the desired results in returning the injured athlete to his normal state faster than the usual and traditional cases used for treatment, namely the use of exercises in the style of (ischemia and hyperemia), as it is a new scientific method in the treatment and rehabilitation of the injury, as it is used immediately after the injury. Contrary to the well-known traditional methods in the field of treatment and rehabilitation that depend on pressure and casting, as it relies on the outputs of anaerobic work by deliberately placing the working muscles of the lower limb (thigh muscles) under anaerobic conditions by ischemia, i.e. (preventing arterial blood from reaching the organ) through the use of a compressive method On those muscles due to the occurrence of a condition (ischemia) of the arterial blood coming to the lower limb through the ankle joint, which is the target of this process, then the injured player performs exercises for the affected joint during periods of time not exceeding (5 / min) with a simple effort during which the player depends entirely on the available energy sources In the lower limb only, and then the pressure device is removed to move to the perfusion stage (hyperemia) and thus the arrival of a large amount of blood loaded with oxygen, nutrients and energy to the affected tissues, and this in turn leads to the displacement of all waste resulting from the injury, which speeds up the process of disposal and prevention Accumulation around the injured joint, and this is in the interest of the player and speeds up the process of his recovery.

The enzyme (cpk) and growth hormone (GH) are among the most important chemical variables that help in finding the exact source of the damaged tissues as a result of the injury, and by studying them, it is possible to determine the speed of their recovery and their return to their normal state before the injury occurred and the faster return of the player to exercise And standing on the extent of the improvement of the player's condition, and therefore it is necessary to find the appropriate method or means that speeds up the healing process, and this is not done except through the exercises used in the style of (ischemia and hyperemia) that are used to treat and rehabilitate the injury

of the ankle joint sprain, as it must be linked accurately With those related chemical variables associated with them.

The importance of the research lies in the preparation of special exercises that carry with it the possibility of treating and rehabilitating the injury of the inverted sprain of the ankle joint according to some chemical variables represented by the enzyme (cpk) and growth hormone (GH) using a pressure method represented by the method (ischemia and hyperemia) for individual sports athletes (gymnastics, swimming, running, tennis) to serve our injured players, coaches, and all those working in the field of rehabilitation and training.

Research Objective

- Identify the effect of exercises in the style of ischemia and hyperemia in the treatment and rehabilitation of the inverted sprain of the ankle joint according to enzyme (cpk) and growth hormone (GH) for individual sports athletes.

Research Hypotheses

Research fields

- Human field: 200 volleyball players in the premier league in Iraq
- Time field: (23/1/2022) to (29/1/2023)
- Spatial field: Peshmerga club hall

Research Methodology and Field Procedures

Research methodology

"The method is that intellectual organization involved in the scientific study, or it is the intellectual steps that the researcher possesses to solve a specific problem" (Malek Alshok, A. 2008). The problem, its nature, and the objectives of the research determine the type of approach used. Therefore, the researchers adopted the experimental approach using the one-group method, "since experimentation is a method for revealing causal relationships between phenomena" (Abedalsatar M & Hanoon W, 2009), and using the pre-, intermediate, and post-tests.

Community and sample research:

"The objectives that the researcher sets for his research and the procedures

that he will use will determine the nature of the sample that he will choose" (Abedalsatar M & Hanoon W, 2009), as the researchers identified the research community represented by individual sports athletes with a sprained ankle joint in the calcaneal-fibular ligament, the men's category, applying for the 2021-2021 sports season. 2022, as their number reached (10) injured. The selection of the sample was based on standardizing the infection in terms of its type, severity, and chronological age after excluding (2) of the infected. Because their injury was of the reflex type, the sample was formed from the injured with limiting the movement of the joint immediately after the injury, the inverted sprain (calcaneofibular ligament) , after contacting and following up on injuries in specialized clinics, doctors, even sports clubs and physiotherapy centers, and through the foregoing, (8) injured people were selected who represent the research sample, as they constituted 80% of the research community, and included (2) gymnastics players, (3) swimmers, and (2) Runners and (1) a tennis player. The specialist doctor at the International Medical Center diagnosed the injury for Physiotherapy. Clinical examinations were conducted for the injured by specialists to ensure the proper functioning of the heart, kidneys, and respiratory system. Table 1 explains this (Table 1).

Methods, tools and devices used in the research

"They are the means through which the researcher can collect data and solve the problem to achieve the goals of the research, whatever those tools are like data, samples, and devices" (Karim. 2009).

- The locally manufactured compressor.
- Diger device for measuring the pulse rate in the foot, made in England.
- Senter fuge separator at a speed of (5000 rpm/min).
- Spectrophotometer (French made).
- Rotameter device for measuring height and weight.
- Computer (Laptop) type Lenovo.
- A support device with handles.
- Stopwatch number (2).
- Medical syringes (5 ml). Medical cotton and sterile materials.
- Plain blood preservation tubes and tubes contain a preservative (ETDA).
- Chemical materials (cuts) to detect the concentrations of the enzyme (CPK) and growth hormone (GH).
- Pasteur pipette for the purpose of drawing blood plasma and serum from tubes after separation.
- Small stick + elastic rope.
- A low sheet of compressed foam, 1 x 1 m wide.
- Personal interviews.
- Assistant work team staff.

Field Research Procedures

Determine the study variables

The researchers identified the chemical variables that fit the study significantly to solve the research problem, and they were as follows:

1. CPK enzyme.
2. Growth Hormone GH.

Compressive method for the occurrence of ischemia and hyperemia:

The locally manufactured compressor was used, which achieves the objectives of the research. It consists of the following parts:

1. **Outer cover:** It is special leather that prevents the expansion of air outwards, has an ideal weight, and does not cause any obstruction to the body.

2. **Air bag:** It is a rubber air bag filled with air between the strong outer cover and the flexible inner cover. There is a special key to enter the air according to a specific pressure using a device that measures the internal pressure in millibars when the player's condition reaches ischemia. The same key can be used to empty the air for the occurrence of hyperemia.

3. **Inner cover:** It is a highly flexible rubber piece, and when the rubber bag is filled with air, the inner cover expands to put pressure on the thigh muscles completely from all sides, and thus puts pressure on the existing arteries, and thus the occurrence of arterial closure or ischemia. As we mentioned earlier, there is a device that determines the amount of air in millibar, in the first case in which ischemia occurs when the pulse in the lower extremities reaches zero.

Method of use: To ensure the safety of the research sample individuals when using the compressive method, the researchers worked on using it under the supervision of a group of doctors specializing in heart and arteries* by placing the patient on a bed, and the compressive method is placed and fixed in the appropriate manner, and the air is pushed in the form of batches, and then the pulse measurement is taken From the proximal artery at the ankle joint using the DIGER device, which is a sensitive device that measures the pulse and blood movement very accurately. When the pulse reaches zero, the air is cut off and the amount of air entered is recorded in milliars for each member of the sample. At the same time, the oximeter is used to measure the level of partial oxygen pressure, and the average calculation was Partial oxygen pressure for all eight members of the research sample is (56.294%) and it is also fixed during the period of therapeutic rehabilitation exercises using the pressure method. Monitoring the previous measurement accurately and maintaining it within the same level as the first in which the case of ischemia occurred and after the end of the exercises, the pressure method is raised to obtain a case Hyperemia.

Exploratory Experience

An exploratory experiment is considered a "mini-experiment of the main experiment, and it must meet the same conditions and conditions in which the main experiment is, as far as possible, so that its results can be taken into account." (Aldulaimi, N, 2009). Therefore, the researchers conducted the exploratory experiment on Sunday, 2/1/2022, on (2) injured athletes from outside the research sample. (ischaemia of arterial blood supply to the lower extremities) and then the occurrence of the condition of hibrima after removing the compression device from the thigh of the injured athlete, and introducing the assisting work team to the nature of the work and other obstacles that the researcher may encounter, as well as conducting rehabilitative exercises designed to treat the inverted sprain injury of the ankle joint associated with the case of ischemia and hyperemia using the compression method and the extent of its suitability for the research sample, as well as the safety of the devices and tools used with the rehabilitation exercises, and the accuracy of the procedures and the extent of their suitability and the willingness of the injured to perform the rehabilitation exercises.

Pre, intermediate and post-tests

Due to the fact that the sample is not ready and not available, but it is obtained according to the cases that come to the hospital or through specialized clinics and sports clubs, and thus the tests were conducted periodically and continuously over the duration of the tests and according to the injuries, and thus the application of the curriculum has also continued during a different period And close and unevenly on the members of the research sample and under the direct supervision of the researchers. Therefore, the researchers conducted the first pre-test on Friday 7/1/2022, the first intermediate test on Saturday 19/29/2022, and the first post-test on Saturday 2/19/2022.

Pre-tests

Pre-tests were conducted on the research sample as follows: Draw a blood sample of (2.5cc) from the injured at rest, in the elite laboratory for pathological analyzes in Baghdad. Samples are taken from the forearm area of venous blood and the injured person is in a sitting position. Blood samples are placed in normal blood preservation tubes to extract blood values. (CPK enzyme concentration, GH hormone) They are numbered according to the sequence of the injured, as the number expresses the name of the injured person, with the help of a chemist specialized in this field, provided that all temporal and spatial

Table 1: Shows the specifications of the research sample.

No.	Variables	Measuring unit	Mean	Std. Deviations	Intermediate	Skewness
1	Length	Cm	170.710	4.533	196.800	0.587
2	Mass	Kg	70.515	2.870	70	0.680
3	Age	Year	22.250	1.569	22	0.433
4	Training age	Year	6.507	1.430	6.100	0.141

conditions are fixed to standardize them in the intermediate and distance tests and to avoid any error.

Therapeutic rehabilitation approach for physical exercises associated with ischemia and hyperemia

The prepared rehabilitation curriculum included performing physical exercises for ischemia and hyperemia in the rehabilitation of ankle joint injuries, which are exercises without weight, exercises using body weight, medical balls, rubber ropes, and exercises using an iron bar. The purpose of these exercises is to strengthen the muscles of the ankle joint and lengthen their strength as well as increase the range movement and attempt to return its range of motion to the normal range and in all directions of movement. All members of the research sample (8) injured athletes underwent the rehabilitative approach, with three therapeutic training units per week, and the program continues for a period of 6 weeks by using the exercises associated with ischemia and hyperemia using the pressure method, which lasts from 3 to 5 minutes during a period of 6 weeks and is used during the main section only. The researcher relied in dividing the time of the therapeutic units on the extent of improvement in the degree of injury.

Intermediate tests

Intermediate tests were conducted on the research sample after a period of 3 weeks of applying the rehabilitation approach associated with ischemia and hyperemia as follows: Measuring the biochemical research variables during rest as mentioned previously in the pre-tests with the same procedures and the same temporal and spatial conditions. The purpose of conducting intermediate tests is to ensure that the sample members are not exposed to unexpected side complications, as well as to see the extent of improvement in the degree of infection.

Post-tests

Post-tests were conducted on the research sample after a period of 3 weeks of the intermediate test and a period of 6 weeks of applying the rehabilitation approach associated with ischemia and hyperemia as follows: Measuring the biochemical research variables during rest as mentioned previously in the pre-tests with the same procedures and the same temporal and spatial conditions.

Statistical methods: The search data was processed through the Statistical Package for the Social Sciences (SPSS) (Million.M.B. 1988, Ayad, A. 2014).

Results and Discussion

Presenting the results of the arithmetic mean values and standard deviations of the enzyme (CPK) and growth hormone (GH) in the test (pre, intermediate and post) of the research sample (Table 2).

Table 2: Shows the arithmetic means and standard deviations of the variables under study in the three tests (pre, Intermediate, and post) for the research sample.

No.	variable	Pre-test		Intermediate-test		Post-test		
		Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	
1	Chemical variables	Enzyme CPK U/L	58.817	6.543	100.866	5.371	143.116	3.920
2		Hormone GH ng/ml	4.460	0.314	2.433	0.290	1.212	0.199

Table 3: Shows the analysis of variance between the three tests (pre, Intermediate, and post) for chemical variables.

Variables	Sum Squares	Degree of freedom	Mean of squares	F value calculated	Level Sig
Enzyme CPK U/L	28245.51	2	14311.80	493.88	0.000*
Error limit	403.410	14	28.782	3	
Hormone GH ng/ml	43.544	2	21.720	250.778	0.000*
Error limit	1.200	14	0.077		

* Significance

Table 4: Shows the value of the differences in the arithmetic mean in the chemical variables of enzyme (CPK) and growth hormone (GH) and the value of the least significant difference (L.S.D) for the three tests (pre- Intermediate -post).

Variables	Tests	differences in the arithmetic mean	Level Sig	Support to
Enzyme CPK U/L	Pre- intermediate	-42.049	0.000*	Intermediate
	Pre-post	-84.299	0.000*	post
	Intermediate- post	-42.25	0.000*	post
Hormone GH ng/ml	Pre- intermediate	2.248	0.000*	Intermediate
	Pre-post	3.275	0.000*	post
	Intermediate- post	1.262	0.000*	post

* Significance

Presenting the results of the analysis of variance test for the chemical variables of the enzyme (CPK) and growth hormone (GH) between the three tests (pre, Intermediate, and post) for the research sample (Tables 3&4).

Discussion

Tables 3 and 4 show that there are significant differences between the three tests and in favor of the post-test for the enzyme (CPK) as it is the largest arithmetic mean between the three tests (pre, medial and post) in the research sample. It includes exercises associated with ischemia and hyperemia and its positive effect on increasing blood supply to working muscles, especially in the ankle joint, and then increasing blood nutrition and developing the sliding property (of actin and myosin) that is closely related to the (CPK) enzyme because this property depends on the presence of energy and then improves The endurance of working muscles and their resistance to fatigue, as it is considered one of the important characteristics that must be developed to resist injury. In addition, the injury in the first stage leads to a spasm in the muscles and the elasticity of the ligaments, and then its effect on the flexibility of the ankle joint. It is known that many joints of the body do not allow the individual except with a certain amount of Flexibility and commensurate with its anatomical structure, through the ligaments that connect the joints.

As for the second reason, it is attributed to the fact that ischemia and hyperemia associated with rehabilitative exercises work to increase the permeability of fine materials in the tissues of skeletal muscles, as this enzyme is present in a large percentage in these muscles, which leads to its liberation into the blood, so its percentage rises, due to the presence of a large percentage of up to (85%) of a CPK analogue in skeletal muscle called the muscle enzyme (CPK-MM). (Melin B. Konlmann. (2001).), In addition, the enzyme (CPK) present in the muscles increases, in order to produce energy to perform the required muscular effort, and an increase in its rate in the blood is an indication of an improvement in the activity of this enzyme in the body in general and locally in the working muscles in particular, as the percentage of this increase reaches from (2-3) Weakening the normal state, intense sports training leads to an increase in the percentage of (CPK) in the blood than its normal rate, so its high rate is considered normal for athletes (Jaleel, E, 2014) (Figure 1).

Tables 3 and 4 show that there are significant differences between the three tests in favor of the post test of growth hormone (GH) as it is the lowest arithmetic mean between the three tests (pre, medial, and post) in the research sample. The researchers attribute the reason for the rise in growth hormone (GH) in the research sample in the pre-test due to the injury of the ankle joint to its main role in the return of the tissues and muscles of the joint to their normal position as a result of the damage caused, and thus the rise is at the beginning of the injury, but this rise begins to decrease as the joint returns to its normal position That is, the main function of growth hormone

(GH) is to increase the growth of all tissues of the body, especially damaged ones (Salama. 2000).

In addition to the reason that led to a decrease in growth hormone (GH) in the post-test, the therapeutic physical exercises associated with ischemia and hyperemia work to expand blood vessels, which increases the provision of the affected area in the ankle joint, especially with oxygen loaded with nutrients that increase its effectiveness and counteract damage. As a result of this injury, it accelerates its improvement in an optimal way, and the use of exercises leads to neurological adaptation in the alternating action of muscle fibers, which is reflected in the development of joint strength, which is related to the role of the main growth hormone (GH), which works to build protein tissue. (Abdel-Fattah. 2003).

This, in turn, confirms that the prepared rehabilitation program had an effective effect on growth hormone (GH) and then treating the injury of the sprained ankle joint as a result of the use of rehabilitative exercises associated with ischemia and hyperemia due to its benefit to connective tissues and muscle growth, which increases the strength of tendons, ligaments and muscles, because growth hormone (GH) is a protein hormone that activates the growth of muscles, tissues, and bones. This is why it is called the body stimulating hormone. It is also associated with general metabolism, and then activates cell division, body growth, and building (Zaytoun. 2002). As "the increase in growth hormone secretion is a form of the body's response to the physical activity exerted." (Jaleel, E, 2014). Also, the decrease in growth hormone (GH) as a result of the exercises associated with ischemia and hyperemia given in the program does not appear clearly, but rather it takes a longer period for its effect to appear on the injury, i.e. a period of 6 weeks was the best, and this is evident through the results of growth hormone ((GH) as well as The effectiveness of the vocabulary of the therapeutic rehabilitative approach prepared by the researchers according to the correct scientific foundations. Increasing the strength of the joint is accompanied by an increase in the degree of injury recovery, as these exercises led to the activation of blood circulation, which led to an increase in blood flow to the area and thus increased muscle nutrition and growth, in addition to increasing the nutrition of tendons and ligaments. And bones, in addition to the fact that exercises increase neuromuscular compatibility, and the continued development and growth of strength in exchange for a decrease in pain levels means that the components of the curriculum were consistent with each other in terms of the use of rest and physical exercises, and that the use of fixed exercises, mobile exercises, and mixed exercises had a clear effect on the development of strength, as strength increases By increasing the use of physical exercises and decreasing in the case of not moving the part, this is consistent with the

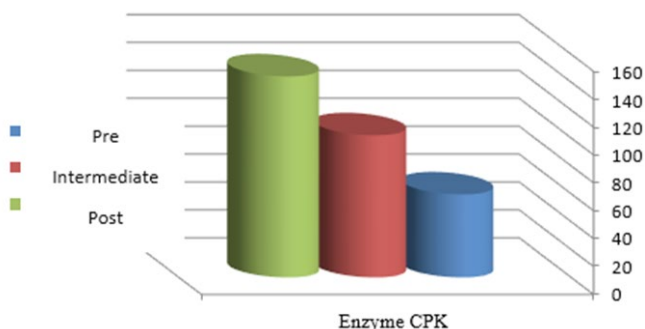


Figure 1: Shows the arithmetic means of the (CPK) enzyme in the three tests (pre, Intermediate, and post).

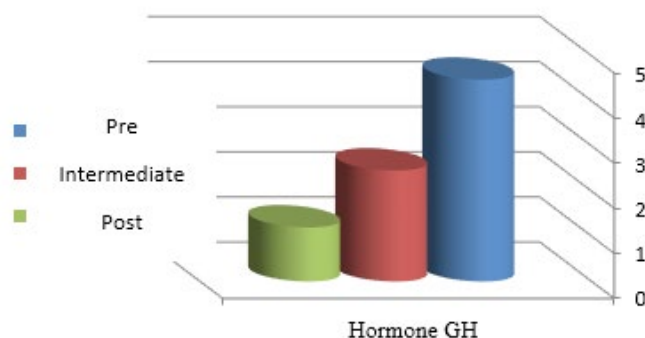


Figure 2: Shows the arithmetic mean of growth hormone (GH) in the three tests (pre, Intermediate, and post).

fact that the development of moral strength is done by choosing fixed and moving exercises that are performed during the training curriculum to reach better results for developing the characteristic of strength (Jeffry. E. Falkel. 1986) (Figure 2).

Conclusions and Recommendations

Conclusions

- The results showed that the exercises in the style of ischemia and hyperemia have a positive effect in the treatment and rehabilitation of the inverted sprain of the ankle joint.
- The decrease in the enzyme (CPK) when the injury occurs is due to damage to the tissues surrounding the ankle joint, which leads to this decrease, but after restoration and the return of the tissues to their normal position, the enzyme begins to increase.
- The increase in growth hormone (GH) at the injury of the inverted sprain of the ankle joint for its main role in the return of the joint tissues and muscles to their normal position as a result of the damage caused, and then the height is at the beginning of the injury, but this height begins to decrease as the joint returns to its normal position.
- The case of ischemia and hyperemia associated with the prepared therapeutic exercises had a positive effect on shortening the rehabilitation and treatment period, which was at an average of (6 weeks) when applying the program compared to the traditional rehabilitation exercises.

Recommendations

- Emphasis on the use of remedial exercises using the method of ischemia and hyperemia within the vocabulary of rehabilitation programs, and reliance on the anatomical and mechanical foundations when preparing them for their significant role in the treatment of injury.
- Need to rely on chemical variables when evaluating the rehabilitation curricula for injuries because they give accurate information about the real condition of the injury.
- Rehabilitation programs should be based on exercises whose range of motion is similar to the anatomical structure of the joint, which helps speed up the treatment of the injury.
- Taking into account the results reached when preparing the rehabilitation curricula to accelerate, treat and rehabilitate players after injury.
- Carrying out more research and studies on the various injuries that affect athletes individually and in their acute stages, in order to delve deeper into the specificity of each injury and to prepare its own rehabilitation programs.

References

Melin B. Konlmann. (2001). Comparison of passive heat or exercise induced dehydration on renal Water and electrolyte excretion the hormonal in volume ment- J. Appl phy .p25.

Bahaa El-Din Ibrahim Salama. (2000). Physiology of Sports and Physical Performance (Blood Lactate), Dar Al-Fikr Al-Arabi, Cairo, p. 151.

Abu El-Ela Ahmed Abdel-Fattah. (2003). Physiology of Training and Sports, 1st Edition, Dar Al-Fikr Al-Arabi, Cairo, p. 165.

Ayesh Zaytoun. (2002). Human Biology, Principles of Anatomy and Physiology, 4th Edition, Dar Ammar for Publishing and Distribution, Jordan, pp. 197-198.

Jeffry. E. Falkel. (1986). Methods of training in sport physical therapy Bernard. T. ditior pupishing Churchill living stonec, USA, New York, p. 76.

Siham Hassan Karim. (2009). The effect of a proposed program in developing mental visualization skills to improve the performance of the table tennis activity for the disabled. Journal of Physical Education. Baghdad University. Volume 21. Issue 1.

Malek Alshok, A. (2008). Impact exercises, especially in the development of speed and its relationship with the completion of (200 m) freestyle. Journal of Physical Education, 20(2), 259–271. [https://doi.org/10.37359/JOPE.V20\(2\)2008.772](https://doi.org/10.37359/JOPE.V20(2)2008.772)

Abedalsatar M, Hanoon W.(2009). The special drills for fatness and their effect in developing some basic skills in basketball for ages (17-18). job [Internet]. Jun. 28 [cited 2023 May 3];21(2):363-82. Available from: <https://jcope.uobaghdad.edu.iq/index.php/jcope/article/view/728>

Aldulaimi, N. (2009). The effects of the Individual & Collective competition pattern on improving the spike and block skills and their retention in

- volleyball of the students. *Journal of Physical Education*, 21(2), 213–238. [https://doi.org/10.37359/JOPE.V21\(2\)2009.723](https://doi.org/10.37359/JOPE.V21(2)2009.723)
- Million. M.B. (1988). *Sports Injuries and Athletic Problems*, Hanley and Belfas INC. USA.
- Ayad, A. (2014). Assess the level of functional adaptation according to some indicators of blood during the period of competition among advanced handball players applicants. *Journal of Physical Education*, 26(4), 115–125. [https://doi.org/10.37359/JOPE.V26\(4\)2014.557](https://doi.org/10.37359/JOPE.V26(4)2014.557)
- Jaleel, E. (2014). The Effect of Training with different Periods on the proportion of growth hormone and some anaerobic, phosphogenic and clatck capacities within Track and Field Athletes. *Journal of Physical Education*, 26(1), 30–40. [https://doi.org/10.37359/JOPE.V26\(1\)2014.37](https://doi.org/10.37359/JOPE.V26(1)2014.37)