

## Using artificial intelligence for small-sided games (05vs05) in continuous and interval methods of albumin protein digestion in U17 soccer players.

استخدام الذكاء الاصطناعي للألعاب الصغيرة (05vs05) في الطرق المستمرة والمتقطعة لهضم بروتين الألبومين لدى لاعبي كرة القدم تحت سن 17 سنة

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### Abstract

This study aims improve on the impact of small-sided games (5vs5) with two continuous and interval training methods. We use artificial intelligence in designing the training units, and the latter works to improve the digestion process, which appears to us through the results of the albumin protein electrophoresis technique. Our study targeted Soccers players, and after conducting measurements represented by blood analysis before and after application, the results concluded as follows:

- Training with small-sided games (5vs5) with the interval method is better than training with small-sided games (5vs5) with continuous method in improving the process of Soccers players.

**Keywords:** Artificial intelligence; small-sided games; continuous and interval methods; Albumin; Soccers players.

### المخلص

تهدف هذه الدراسة إلى تحسين تأثيرات الألعاب المصغرة (5 ضد 5) بطريقتين تدريبيتين المستمرة والفترية وذلك باستخدامنا الذكاء الاصطناعي في تصميم الوحدات التدريبية وهذه الأخيرة تعمل على تحسين عملية الهضم التي تظهر لنا من خلال نتائج تقنية الفصل الكهربائي لبروتين الألبومين، واستهدفت دراستنا لاعبي كرة القدم للفئة السنية أقل من 17 سنة، وبعد اجراء القياسات البيوكيميائية المتمثلة في تحليل الدم قبل تطبيق الوحدات التدريبية وبعد التطبيق خلصت النتائج الى مايلي:

التدريب بالألعاب المصغرة (5ضد5) بالطريقة الفترية أفضل من التدريب بالألعاب المصغرة بالطريقة المستمرة في تحسين عملية الهضم من خلال الفصل الكهربائي للبروتين لدى لاعبي كرة القدم. الكلمات المفتاحية: الذكاء الاصطناعي؛ الألعاب المصغرة؛ الطريقة المستمرة والفترية؛ الألبومين؛ كرة القدم.

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## Introduction

The methods of sports training have developed tremendously in the twenty-first century, becoming more suitable for the players. The coach has to follow the latest developments in the training area to continuously provide the best and most optimal in this area in order to improve the performance level of its players, whether from the physical, skillful, or numerical aspects. The sciences which is related to sports training represent amazing importance in the process of preparing and developing the player throughout his training life. The coach who does not have the correct knowledge of these sciences will not be able to develop his players in a suitable way because he will not be able to identify the real causes of the different adaptations that occur to the body, whether they are physical, physiological, psychological stress, etc. Modern sports sciences help to maintain the discovery and prediction of more facts related to the physiological characteristics of the players and the diverse and interrelated effects of the physical load, forms of recovery, dietary systems, in addition to the biomechanical factors that allow increasing the motor ability of the performance of the modern player (Ahmed and al. 2023. P 737). Antonacci points out and says: Among the modern training methods that work to develop the physical and other qualities in football, the method of training in small spaces, small-sided games, which works to make a qualitative leap in the capabilities required by modern football, and training with small-sided games plays an important role in developing the technical and tactical capabilities in addition to the physical capabilities (Antonacci. 2007. P415).

Koklu mentioned that many European schools and academies employ small-sided games in their training to develop the physical, physiological and play plans for their age stages, and consider them an essential part of the training unit and give them more time in the daily units, and the coaches use small-sided games to create situations similar to the match to develop the physiological and physical aspects of the young soccers players, where the coaches and experts vary in the exercises within the training units, some of them use continuous exercises, some of them use periodic exercises, and some of them use them together, and this is to apply the principle of diversity, which is One of the most effective training principles of sports training. (Köklü and al. 2011.P128). Today's technological development has become more effective in giving a mental image of the sports exercises for the players, and a new technique has emerged that has added a qualitative leap in this regard, known as artificial intelligence technology. Artificial intelligence contains a set of techniques, the most important of which is augmented reality (Augmented Reality) technology in the field of artificial intelligence, which aims to integrate digital elements with the surrounding reality to improve the user experience and the way augmented reality technology works based on environmental sensing: a set of sensors such as cameras and motion sensors are used to monitor and understand the surrounding environment to determine the locations and objects: the locations of the objects and elements in the real world are determined using techniques such as image recognition and shape analysis and data processing: artificial intelligence algorithms and machine learning techniques are used to process and analyze the data taken from the

sensors to understand the environment and determine the locations of the digital elements, and the digital elements such as images, texts, or videos are displayed in real time on the screen of the device used, while retaining the vision of the real reality. We also find the integration of digital elements where the digital elements are smoothly integrated into the surrounding reality, so that they appear as if they are part of the actual environment and the user interacts with them and users can interact with the digital elements, whether by touching the screen or using special control interfaces in addition to updating the elements. The digital elements are constantly updated based on the user's movement and environmental changes, which makes augmented reality technology dynamic and allows us to give a more accurate mental image to the players and encourage them to perform during the small-sided games. We relied on it in our research by presenting a group of small-sided games to the players on a projector screen by computer through videos of some coaches preparing their players with small-sided games and also presenting them with an interrogation of some coaches about the mechanism of applying artificial intelligence in small-sided games. We found some coaches agreeing to the possibility of applying artificial intelligence through the use of augmented reality technology to motivate the players and also displaying the videos and illustrative pictures makes the players widely aware of this important aspect and thus the players have a correct mental image of the movements and sports exercises used in the small-sided games in soccer players and they have the ability to listen and listen to their coaches' instructions when applying the small-sided games and thus we see stronger performance and more effectiveness in order to improve the vital and physiological functions in them and achieve results during the sports competitions. To ensure that any type of training method is effective, it must be performed in a way that ensures the greatest possible physiological benefit. regarding the individual's life. And its activity, metabolism has an important role, and here we are talking about proteins

Hashmat and Shalaby (2003) indicate that proteins play the main role in the construction of living matter, as well as in the implementation of vital processes, and when life exists, we find that it is associated with the existence of a protein body, and wherever a protein body exists, we invariably encounter phenomena of life. said Hashmat (1999) mentions that proteins include exogenous amino acids that the body can not produce itself and the number of which is estimated at 10 amino acids, as well as non-essential

amino acids that the body can produce itself and the number of which is estimated at 12 amino acids. Proteins are broken down in the digestive system under the influence of small intestine and pancreatic enzymes on amino acids that are absorbed from the duodenum to the blood transports it to all cells of the body. Also, protein metabolism occurs in the muscles and the results of its breakdown are water, CO<sub>2</sub>, and urea, and Hashmat (1999) adds it is possible to infer the functions of the liver, kidneys and heart by protein metabolism and enzymes.

Through browsing the World Wide Web (Internet), the researchers noticed the novelty of the small-sided games exercises and also how to use a training program with small-sided games with artificial intelligence to motivate the players first by watching them and also seeing the effect of this program in improving the digestion process through specific effects of albumin protein. In the training field and through reviewing the previous studies available to the researchers and within their knowledge, we noticed the absence of any Arab study that dealt with the link between small-sided games exercises using artificial intelligence technology and also protein in the sports field in general and in football in particular.

Based on the above, the researchers conducted this study under the title "Using artificial intelligence in designing training units with small-sided games (05 vs 05) in the continuous and Interval method to improve the digestion process through the electrophoretic separation technique of albumin protein.

## **1.Research hypotheses:**

**1.1** Training with small sided-games (05vs05) with the interval method is better small sided-games (05vs05) with the continuous method in improving total protein and albumin for the benefit of the second group that trains with the interval method among soccers players under 17 years old.

## **2. Revious and similar studies to the research:**

**2.1** Rebecca et al (2002) conducted a study entitled "Exercise and increased fat metabolism for gene expression in human skeletal muscles" this researcher applied the first experimental design On a sample of (7) individuals (3 males, 4 females) with an average age of 28.9 and a body mass index of 22.6 kg/m. A training program was applied for (9) days at a rate of 60 minutes per day on the ergometer and the results is found physical training increases the degree of gene expression of FAT/CD36 gene and increases the complete oxidation of fats by 24%.

**2.2** Matthew et al (2006) conducted a study entitled "Aerobic training exercise increases protein turnover in skeletal muscles of healthy adults at rest" with the aim of identifying the effects of aerobic training on protein metabolism in healthy adults. The sample of the study consisted of (8) untrained individuals, and the researchers used the experimental method and applied the aerobic training program for (4) weeks. The most important results showed that aerobic training led to improved protein metabolism levels in the rest period for the sample of the study.

**2.3** Study by Dellal et al. (2012) Effects of small-sided games and intermittent training on amateur soccer players: influence of aerobic capacity and the ability to perform intermittent exercises with changes of direction. The objectives of this study: To compare the effect of small-sided games versus high-intensity interval training on

developing aerobic capacity and changing direction by 180 degrees. The sample was 22 amateur players divided into 3 groups: small-sided games group 8 players .Interval training group 8 players. Control group 6 players. Also, the approach followed was an experimental approach.

- Important results:
  - Small-sided games and the interval training group were equal in the effectiveness of developing respiratory capacity and the ability to perform intense interval exercises. Compared to the control group over a period of 6 weeks.
  - The ability to change direction by 180 degrees is similar in all groups.

#### **COMMENTING ON THE PERVIOUS AND SIMILAR STUDIES:**

### **3. Commenting on the pervious and similar studies:**

Through the studies that we presented and that we used for their similarity with our study that studies the effect of small-sided games (05 vs 05) on improving the digestion process for soccer players under 17 years old.

#### **3.1 SIMILARITIES:**

In the first study: This study aimed to identify exercises and increased fat metabolism for gene expression in human skeletal muscles and it was similar to our study in the dependent variable, the method used, the applied test protocol.

In the second study: The study targeted the effects of aerobic training on protein metabolism in healthy adults and it is similar to our study in the dependent variable in addition to using the researcher's experimental method and choosing the sample intentionally.

In the third study: The aim was to determine the effects of short games and intermittent training on amateur soccer players: The effects of aerobic capacity and the ability to perform intermittent training with change of direction are similar to our study in the independent variable in addition to using the researcher's experimental method and choosing some measurements such as height, weight and chronological age as we relied on in our research.

#### **3.2 DIFFERENCES:**

The difference between our study and the previous and similar studies lies in the training units or the proposed training program in terms of content and type and nature of the exercises chosen, as well as differing with the first, second and third study in the age group where the researchers studied on the senior category while our study targeted

the category less than 17 years old, while the fourth study targeted the age group less than 12 years old and our study targeted the age group less than 17 years old.

#### 4. The research method:

The researchers used the experimental method with an experimental design with before-after measurements for two experimental groups because it was suitable for the application and procedures of the study. Research Sample: The research sample was deliberately selected among the players of the Djelfa Achbal football club and the total size of the research sample consisted of (28) players who trained the fit game (5 VS 5) for the players under 17 and (8) were of implementation excluded from a pilot study on them, therefore, the basic research sample consisted of (20) players divided into two equal and equivalent groups, and the researchers conducted a study on the uniformity of height, body weight, chronological age, Training age, see Table No. (1).



**Table 1: Explains to us the values of the mean, standard deviation and skewness coefficient for the two experimental groups with respect to age, weight, height and training age. At a significance level of 0.05**

| Variables         | Experimental group 01 |                    | Experimental group 02 |                    | Skewness coefficient for experimental group 01 | Skewness coefficient for experimental group 02 |
|-------------------|-----------------------|--------------------|-----------------------|--------------------|------------------------------------------------|------------------------------------------------|
|                   | Mean                  | Standard deviation | Mean                  | Standard deviation |                                                |                                                |
| Chronological age | 15.40                 | 0.69               | 15.40                 | 0.51               | -0.78                                          | 0.48                                           |
| Weight            | 60.20                 | 1.31               | 57.70                 | 1.25               | -0.088                                         | 0.99                                           |
| Height            | 1.59                  | 1.01               | 1.57                  | 0.015              | -0.65                                          | 0.03                                           |
| Training age      | 4.50                  | 0.35               | 4.50                  | 0.35               | 0.00                                           | 0.00                                           |

Table No. (1) shows that the values of the skewness coefficient ranged between  $\pm 3$ , which indicates the homogeneity of the research sample.

#### 5.Data collection tools and methods:

##### 5.1. The devises and tools used in the research:

- A stadiometer. (To measure the height cm)

- A medical scale. (To measure the weight kg)
- Sterile plastic cotton swabs of size (5 cm) for single use - Betadine disinfectant - Cotton - A special medical bottle (for drawing blood samples).
- An icebox to preserve the blood samples until they are transferred to the laboratory.
- Sterile test tubes containing heparin to put the blood in them immediately after drawing the sample.
- A flow cytometer to analyze the samples.
- A measuring tape to measure the player's length.
- Training cones.

## 5.2. The test used in the research:

### 5.2.1. Biochemical test:

- Electrophoretic separation of protein (protein denaturation).
- Blood samples were drawn at rest and placed in glass tubes and stored in a bottle with ice and then blood samples were analyzed by measuring protein metabolism levels.



## 6.THE PILOT STUDY:

The researchers conducted a pilot study in the period from Saturday 01/11/2023 to Tuesday 19/12/2023 on a sample of (08) players from the research population and outside the basic research sample for the purpose of.

- Ensuring the validity of the devices and tools used
- Ensuring the safety, execution and application of measurements and tests and related procedures in accordance with the conditions established for them.
- Training to increase the information and experience of the assistants in supervising the implementation of the measurements and tests in order to identify the errors that may occur during the implementation and to ensure the accuracy of data recording
- Determine the time required for the measurement process and the time required for each soccer players for each exercise separately to determine the duration of the tests and measurements.
- Arranging the exercises and their performance and standardizing the rest periods between them
- The suitability of the exercises under study for the selected sample
- Identifying the difficulties that the researcher may face while conducting the basic study
- Adapt the program to the basic research sample



## 7. Steps to prepare the training units with small-sided games using artificial intelligence:

Conduct a comprehensive survey of previous research and studies in the field of small-sided games training to determine the research variables and the scientific parameters that were conducted on samples similar to the research sample.

Interview experts and benefit from their diverse experiences in determining the research variables and designing the training units for this age group.

Show the training units to the players through the computer through explanatory videos in order to apply them well and the players have a mental image of all the exercises that the coach will apply with them.



- The training load has been regulated in the training units by calculating the Rating of Perceived Exertion (RPE).

## 8.Steps to implement the research:

After determining the basic variables and the tools and devices used, the researchers drew blood samples to measure the electrophoretic separation of protein and perform in light of the following procedures.

- (5) cm was drawn from each player to perform the necessary analyzes on them on Saturday, 16/11/2023
- Performing the pre-measurements for the biochemical tests and it took two days, namely Sunday and Monday, corresponding to 17, 18/11/2023 AD.
- Start implementing the training units for small-sided games exercises on Saturday, 20/11/2023, where it took (4) weeks consisting of (08) training units at a rate of (02) training units per week
- Performing the post-measurements immediately after the completion of the application of the basic experiment on Saturday, 20/12/2023 and with the same sequence of pre-measurements.

## 9.Statistical treatments:

The researchers used the following statistical methods:

- The mean
- The SD "standard deviation"
- Improvement rates
- t-test
- Correlation coefficient (**Morris Ingers. 2004. P234**)

## 10. Presentation and discussion of the result:

### 10.1 Presentation and analysis of the pre-post blood biochemical test for the two experimental groups:

#### 10.1.1 Presentaion and analysis of the result of the blood biochemical test by the electrophoretic separation technique of protein for the first experimental group:

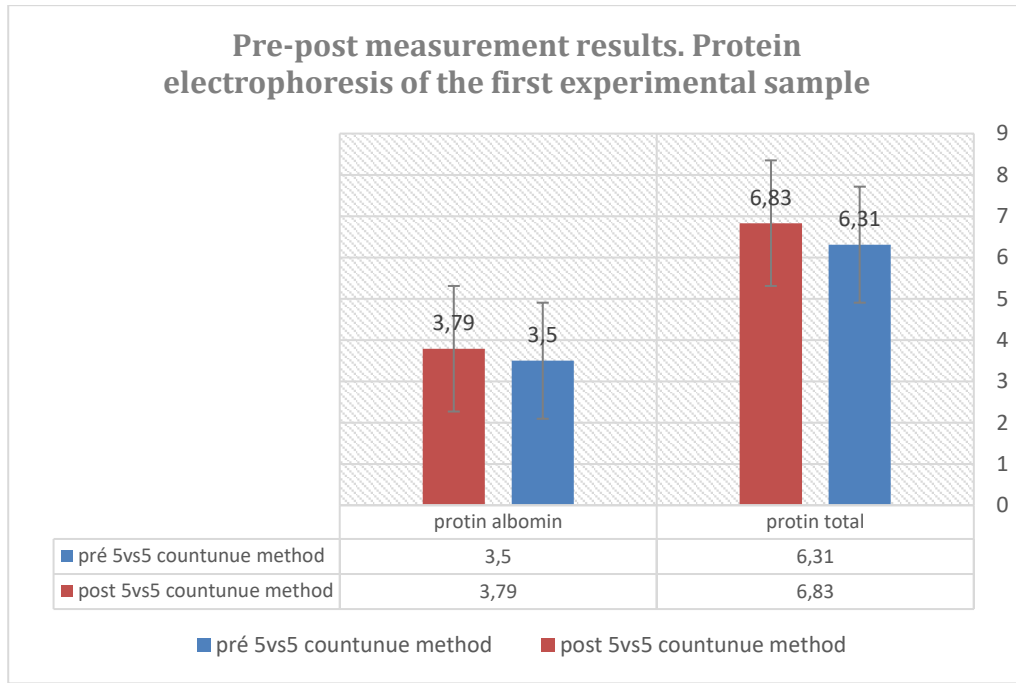
**Table number 2: Presents the results of the test of the importance of the differences between the pre- and post-measurements for the experimental group that trains with small-sided games (05 vs 05) in a continuous way in the biochemical variables.**

| <i>Variables</i>     | measure unit | Pre-measure<br>(continuous training) |       | Post-measure<br>(continuous training) |       | progress rate % | value (T) | SIG | Statistical significance |
|----------------------|--------------|--------------------------------------|-------|---------------------------------------|-------|-----------------|-----------|-----|--------------------------|
|                      |              | $\bar{X}$                            | SD    | $\bar{X}$                             | SD    |                 |           |     |                          |
| <i>Total protein</i> | g/dl         | 6.31                                 | 0.21± | 6.83                                  | 0.18± | 8.24            | *19.71    | 0.0 | significance             |
| <i>Albumin</i>       | g/dl         | 3.50                                 | 0.24± | 3.79                                  | 0.19± | 8.29            | *6.83     | 0.0 | significance             |

- Significance level 0.05
- n = 10

Table 3 shows that for the experimental group there are statistically significant differences between pre- and post-measurement in terms of the biochemical variables tested and in the direction of post-measurement, and the improvement rates for total proteins were 8.24%. to 8.92% for albumin.

**Figure 1: Shows a graphical representation of the results before and after measuring electrophoretic protein separation for the first experimental group continuously training small sided games (05 vs. 05).**



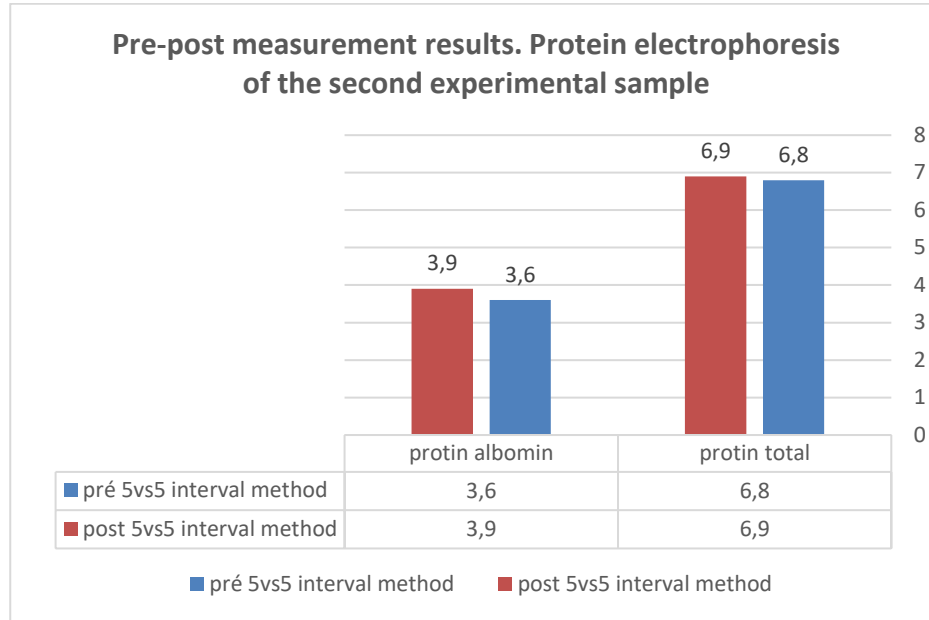
#### 10.1.2. Presentaion and analysis of the result of the blood biochemical test by the electrophoretic separation technique of protein for the second experimental group:

**Table number 3: Presents the results of the significance test of the differences between pre- and post-training measurements for the experimental training group with small-sided games (05 vs 05) at intervals in biochemical variables.**

| <i>Variables</i>     | measure unit | Sample 1 is trained in the continuous method |       | Sample 2 is trained in the interval method |       | progress rate % | value (T) | SIG | Statistical significanc e |
|----------------------|--------------|----------------------------------------------|-------|--------------------------------------------|-------|-----------------|-----------|-----|---------------------------|
|                      |              | $\bar{X}$                                    | SD    | $\bar{X}$                                  | SD    |                 |           |     |                           |
| <i>Total protein</i> | g/dl         | 6.83                                         | 0.18± | 6.90                                       | 0.13± | 8.00            | *19.21    | 0.0 | significanc e             |
| <i>Albumin</i>       | g/dl         | 3.79                                         | 0.19± | 3.90                                       | 0.14± | 8.04            | *6.79     | 0.0 | significanc e             |

- Significance level 0.05
- n = 10

Table 3 shows that for the experimental group there are statistically significant differences between pre- and post-measurements in terms of the biochemical variables tested and in the direction of post-measurement, and the improvement rates ranged between 8.00% for total proteins and 8.04% for albumin.



#### 10.1.3. Presentaion and analysis of the result of post-post for the two experimental samples:

Table number 4: represents a comparison between the results of the biochemical analysis of blood using the protein electrophoresis technique for the two experimental samples in post-measurements.

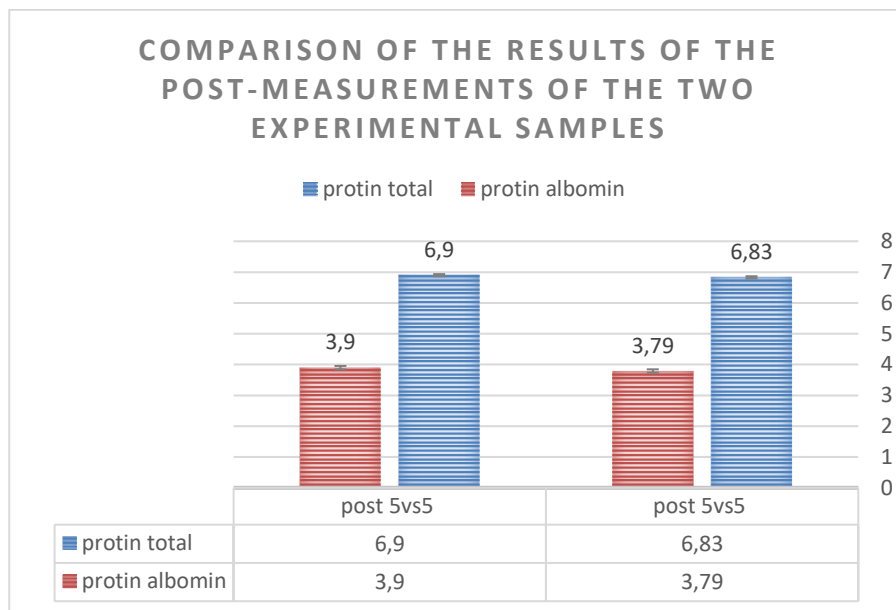
| Variables            | measure unit | Pre-measure (continuous training) |       | Post-measure (continuous training) |       | progress rate % | value (T) | SIG | Statistical significance |
|----------------------|--------------|-----------------------------------|-------|------------------------------------|-------|-----------------|-----------|-----|--------------------------|
|                      |              | $\bar{X}$                         | SD    | $\bar{X}$                          | SD    |                 |           |     |                          |
| <i>Total protein</i> | g/dl         | 6.80                              | 0.19± | 6.90                               | 0.13± | 8.00            | *19.22    | 0.0 | significance             |
| <i>Albumin</i>       | g/dl         | 3.60                              | 0.18± | 3.90                               | 0.14± | 8.04            | *6.80     | 0.0 | significance             |

✓ The significance level is 0.05

✓ n = 10

Table 4 shows that there are statistically significant differences in the final measurements of the biochemical variables tested and in favor of the second experimental test trained according to the interval method with small sided-games (5 vs 5), where the arithmetic mean = 6.90. which is slightly higher than the arithmetic mean of the first experimental sample. mean =6.83

The improvement rates ranged from 8.00% for total protein to 8.04% for albumin.



### Discussion of the results of the general hypothesis:

This indicates that there are statistically significant differences between the measurements of the two experimental groups for total protein and albumin in favor of the second experimental group, which exercised intermittently. This was evident from table (4) which indicates that there are statistically significant differences between the measurements according to the two experimental groups with regard to the biochemical variables tested and in the direction of measurement according to the measurements from the second experimental group that trains with the interval method with small-sided games, and the improvement rates ranged from 8.24% for total protein to 8.92% for albumin. The researchers attribute these differences to the fact that small-sided games exercises with the continuous method caused a biological adaptation for the players, as well as the exercises with small-sided games with the intermittent method caused a biological adaptation as well and this appeared through the differences found in the levels of total protein and albumin in favor of the final measurements of the two experimental groups and we also add that the exercises with small-sided games with the intermittent method were slightly better than the exercises with small-sided games with the continuous method in improving and increasing the percentage of protein in the blood, by comparing the arithmetic means in the post measurements in both experimental groups. This was confirmed by Koklu et al, (2011) that physical effort works to renew and consume the total protein in the body. And about the mechanism of increasing the protein present in the body, Hashmat and Shalaby (2003) indicate that, according to research, physical training leads to increased hormone levels, especially the anabolic ones, such as testosterone, a male hormone, and estrogen, a female hormone,

In addition to growth hormone GH and IGF1, insulin-like growth factor and all of these hormones lead to protein production because growth hormone works by stimulating the liver hormone IGF1, which directly produces cellular proteins. They also add that there are important hormones that participate in the increase during training, such as ACTH hormone, the hormone that stimulates cortisol, as well as endorphins, which are the blood inhibitors. And about the improvement of albumin, Smith et al (1998) indicate that the reason for the increase in albumin after performing the proposed exercises arise from the fact that physical exercise is accompanied by a decrease in blood volume and an increase in blood concentration due to the steam and sweat accompanying exercise, which contributes to the occurrence of training adaptation.

This result was confirmed by Robergs and Robert, (1997) where they explained that albumin works to stabilize water in the blood due to osmotic pressure and during physical exertion, increase in blood with increased sweating and dehydration or after taking a certain amount of albumin in the form of an injection. However, regarding the correlation between increased albumin and total protein, Song (1990) states that albumin constitutes 50-60% of total protein and that this protein is used by cells.

Hashmat (1999) confirms that proteins include exogenous amino acids that the organism cannot synthesize and the number of which is estimated at 10 amino acids, and non-essential amino acids that the organism can synthesize and the number of which is 12 acids. Proteins are broken down in the digestive tract under the influence of intestinal, pancreatic and small intestinal enzymes into amino acids, which are absorbed into the blood by the small intestine and transported throughout the body. Because the role of albumin in the body includes transporting nutrients to the body's cells, where the latter transports the most important nutrients from the absorption pathways of the intestine, and here we mean the blood and lymphatic pathways, the results of digestion are transferred to the body's cells, and among the most important elements that it transfers, we mention the fats that albumin transfers in the blood and to the cells to benefit from them in producing energy or storing them, also hormones are transferred by albumin through the blood to the places that need them. Also, fat-soluble vitamins are transferred by albumin to the cells, in addition to minerals such as calcium and zinc, which are transferred by albumin through the blood to the cells, and thus albumin contributes to maintaining the balance of nutrients in the body and providing the energy necessary for the functions and cells. It has been scientifically proven that physical exercises improve the work of this important physiological aspect and training with small-sided games in soccer players in particular works on that because it is modern and standardized and is used by all coaches in the European leagues and with different age groups because it causes a physiological adaptation process. (Abdel-Fattah, 2003.P 212) the results of this study are consistent with the studies by Rebecca et al. (2002) and Matthew et al (2006) found that physical exercise increases total protein levels in the blood.

Also, the results of this study are consistent with the study by Rebecca et al. agree. from 2002 entitled "Exercise and Authentic Lipid Metabolism for Gene Expression in Human Skeletal Muscle" and with the study by Matthew et al. Adults", as well as a study by Dellal et al. (2012). entitled "The effects of small games and intermittent training on amateur soccer players" The effects of aerobic capacity and the ability to perform exercises intermittently with changes of direction.

Given the research results, the researchers came to the following conclusions:

- There are statistically significant differences between the before and after measurements of the first experimental group, which performs games in small-sided games continuously during the biochemical tests on the electrophoretic separation of proteins and until the final measurement.
- There are statistically significant differences between the measurements before and after the first experimental group, which trained interval with small-sided games groups until the biochemical tests by electrophoretic separation of proteins and until the final measurement.
- There are statistically significant differences in the final measurements of the two experimental groups trained with small-sided games, in the both methods combined in biochemical tests by electrophoretic separation of proteins, and in favor of training the second experimental group with small-sided games in an interval way.

Given the research results, scientists recommend the following:

- Varied exercises in small-sided games, taking into account the gradation of intensity, individual differences and the motivation of each individual.
- Necessity of applying protein separation measurements to identify the nature and condition of the players especially in the early childhood stage in order to develop training programs that improve their level.

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