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The Effect of Boxing and Rowing Sports on Protein Metabolism

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Abstract

This study was conducted on a sample of "14" fourteen players, with "7" seven players for each specialty (boxing and rowing), who were purposively selected. Blood was drawn from the vein in two stages of the boxers and rowers with a rate of "4" cm3 of the blood using an ergometer in each stage for each player before the experiment and after the experiment.

All chemical analyses and medical procedures were carried out by a specialized and certified doctor in "El-Rahman Laboratory" for medical analyses and hematology. This study aims at identifying the effect of boxing and rowing on protein metabolism (amount of total protein, albumin, globulin, alpha antitrypsin, transferrin, immunoglobulin G "IgG", immunoglobulin M "IgM", haptoglobin) in blood serum.

The results of this study showed a significant increase in the amount of total protein, albumin, alpha antitrypsin, transferrin, immunoglobulin G "IgG", and haptoglobin.

In the case of intensive exercise, the body derives its energy not only from stored fats, but from proteins in the tissues, therefore, the researchers recommend that the athletes who perform an intensive effort to take protein food into consideration so as to reduce the rate of breakdown of proteins within the tissues.

Introduction and research problem:

Reaching the top levels requires well preparation of the players in various technical, physical, physiological and biochemical aspects.

The sports of boxing and rowing require a high degree of physical, physiological and biochemical competence from their practitioners, which enables the boxing and rowing players to finish the match or race efficiently and with minimal physical effort and in the shortest possible period of time.

Boxing and rowing players are subjected to firm training in order to reach the world levels and gain confidence during the championships and races in which many changes occur. However, during championships and races, many biochemical changes occur within the athletes' body, which differ from a sport to another and from a championship or race to another. This requires the personnel of the educational and training processes to quickly stand up to the level of such biochemical changes, in order to develop good and appropriate training programs to raise sports in Egypt at international levels.

The sports of boxing and rowing are characterized by continuous muscular effort by involving many muscle groups in the bodies of the boxing and rowing players during the championship or the race, in order to produce and use the motor power of the boat efficiently and move the boat in the water medium to the finish line in the least time. (Getchell: 2000) (Kirsch and Schultze: 2019) (Klafs and Joan Lyon: 2015) (Tancred and Tancred: 2014) (Katch and Mcardel: 1997)

Training from the physiological aspect is manifested in exposing the various organs of the body to training loads and burdens, so as to make changes in their stability, adaptation and acclimation. The interpretation of physiological phenomena and biochemical changes related to physical work is also considered as a criterion for research and interpretation with the aim of developing training and raising the efficiency of the training status of athletes, especially for the boxing and rowing players.

(Appenzeller: 2010) (Thomas: 2008) (Harper: 2007) (Larson: 1974) (McNaught and Callander: 1915)
Blood is the focus of biochemical changes in the human system, since the changes occur in the blood circulation after exerting efforts and that reflects the adaptation of the athlete's body systems to such effort.
Muscular activity produces a release of energy that helps us detect and understand many physiological and biochemical processes during training.
The breakdown of protein in the muscle increases at any rate under the conditions that lead to the energy production and consumption. (Montactle: 2016) (Zak and Drahota: 2014) (Appenzeller: 2010) (Sloan: 2010) (Guyaton: 2009) (Getchell: 2000) (McNaught and Callander: 1915)
There are still many scientific questions about the level and nature of biochemical changes that occur in the athletes' bodies, especially the boxing and rowing players during the various championships and races, as well as identifying the effect of boxing and rowing on such biochemical changes, whether before, during or after the championships and races, in addition to providing the training personnel with the basic information from the biochemical and physiological aspects of the boxing and rowing players.
This study aimed at identifying the effect of boxing and rowing on protein metabolism and taking advantage of its results, to improve planning and training programs, and improving the performance level of the boxing and rowing players compared to the international levels.

Objective of the study:

Identifying the effect of boxing and rowing on protein metabolism.
Since protein is an important source of hormones and enzymes that control all of the biochemical reactions within the athlete's body, which is reflected in the athlete's performance level and the continuation of muscular effort during the championship or race until victory.
Determining the diversity of total proteins, albumin, globulin, antitrypsin, transferrin, immunoglobulin "G", immunoglobulin "M", and haptoglobin immediately after finishing the training program.

Research hypotheses:

1. The concentration level of "protein" in the blood serum may increase after applying the experimental program than before.
2. The concentration level of "albumin" in the blood serum may increase after applying the experimental program than before.
3. The concentration level of "globulin" in the blood serum may decrease after applying the experimental program than before.
4. The concentration level of "antitrypsin" in the blood serum may increase after applying the experimental program than before.
5. The concentration level of "transferrin" in the blood serum may increase after applying the experimental program than before.
6. The concentration level of "immunoglobulin G" (IgG) in the blood serum may increase after applying the experimental program than before.
7. The concentration level of "immunoglobulin M" (IgM) in the blood serum may increase after applying the experimental program than before.
8. The concentration level of "haptoglobin" in the blood serum may decrease after applying the experimental program than before.

Study procedures:

Methodology:

Based on the nature and objectives of the research and the characteristics of the available sample, and in order to confirm the validity of its hypotheses, the researchers used the experimental method for the sample under study with the pre- and post-measurements. Boxing and rowing are sports that share similar basic physical requirements of general endurance and performance endurance, as well as relying on the muscles of the arms, the shoulder girdle, the erect muscles of the spine and the necessary skeletal muscles. The requirements for performance are also similar in terms of general stamina and psychological stamina for performance, and the requirements for general preparation of the athletes' physical characteristics are similar in their components as well.
Rowing training devices are also used to develop the boxers' endurance, and the cooperation between boxing and rowing is obvious in the transitional period, in which it is possible to practice different activities and movements of the trunk and shoulder.

Research sample:

The study was conducted on a sample of boxing and rowing players which consisted of "14" fourteen players ("7" seven boxers, "7" seven rowers) with "7" seven players in each specialty from the men's class of boxing players and the under-23 years class of rowing players. The study was purposively selected from the boxing and rowing players, and all medical examinations were conducted on the members of the sample to ensure the safety of the players' physiological devices.

The researchers set some conditions to select the sample members:

- The players must be registered at the Egyptian Federation of Boxing and the Egyptian Rowing Federation.
- The players must have practiced the specialized activity for at least three sports seasons and participated in the last Republic championship.
- The players must be under 23 years old, and still practice boxing and rowing.
- The boxing sample is selected from El-Nasr Youth Center in Alexandria.
- The rowing sample is selected from El-Sayd Club in Alexandria.

Statistical description and homogeneity of the research sample:
The researchers conducted the statistical description of the research sample (boxing and rowing players) to identify the homogeneity of the research sample regarding protein metabolism as shown in the following tables:

Table (1)
Statistical description of the research sample basic measurements of the boxing and rowing players (n = 14)

S.	Basic measurements	Lowest value	Highest value	Arithmetic mean	Median	Standard deviation	Skewness	Kurtosis
1	Age (year)	20	22	21.21	21	0.699	-0.321	0.306
2	Length (cm)	18	186	171.79	184	44.303	-3.730	-0.276
3	Weight (kg)	84	96	87.64	86	3.565	1.150	0.461
4	Training age (year)	3	5	4.29	4.5	0.825	-0.625	-0.260

Table (1) which illustrates the lowest and highest values, the arithmetic mean and the standard deviation in the basic measurements shows that the skewness coefficients are close to zero, and the kurtosis coefficients are limited to (±3), which indicates the lack of dispersion, the moderation of values, and the homogeneity of the research sample members of boxing and rowing players.

Table (2)
Statistical description of the research sample protein metabolism measurements of the boxing and rowing players (n = 14)

S.	Measurements		Lowest value	Highest value	Arithmetic mean	Median	Standard deviation	Skewness	Kurtosis
1	Protein (g/ dL)		6.2	6.6	6.42	6.52	0.167	-0.379	-0.572
2	Albumin (g/ dL)		3.9	4.45	4.11	4.015	0.224	0.924	0.428
3	Globulin (g/ dL)		2.61	2.71	2.66	2.65	0.037	0.519	0.211
4	Antitrypsin (g/ dL)		220	265	239.86	242	17.853	0.283	-0.120
5	Transferrin (mg/ dL)		190	228	210.93	215	14.008	-0.482	-0.291
6	Haptoglobin (mg/ dL)		155.4	172.3	163.45	162.25	6.071	0.207	0.198
7	Immunoglobulin - IG (mg/ dL)	(IgG)	1218	1418	1322.5	1380	93.112	-0.254	-0.618
		(IgM)	164.3	180.9	173.09	176.8	7.041	-0.239	-0.528

Table (2) which illustrates the lowest and highest values, the arithmetic mean and the standard deviation in the measurements of protein metabolism shows that the skewness coefficients are close to zero, and the kurtosis coefficients are limited to (±3), which indicates the lack of dispersion, the moderation of values, and the homogeneity of the research sample members of boxing and rowing players.

Spatial domain:
The experiment was conducted at El-Sayd Club in Alexandria governorate, under the supervision of the researchers, blood was drawn from the vein in two stages of the boxers and rowers with a rate of "4" cm3 of the blood in each stage for each player before the experiment and after the experiment, in order to find out the potential medical biochemical changes that may occur in the players' bodies. All analyses and medical procedures were carried out by a specialized and certified doctor in "El-Rahman Laboratory" for medical analyses and hematology.

Temporal domain:
The study was conducted during the 2022 training season from 3/6/2022 to 9/9/2022.

- The researchers trained the sample members of boxing and rowing to use the ergometer in order to assist the boxing players to reach the rowing players' level in using the ergometer until the two groups are at the same level in the efficiency of using the device. The training process lasted for a month before the start of the experiment.

As for the codified load on the ergonomic wheel: The ergonomic bike was used as follows:

1. The load intensity was set at 500 kg (approximately 3.83 watts).
2. The rate of pedaling on the ergonomic bike was determined by (60-70 laps / min.).
3. The average time recorded for the sample members to continue performing at this intensity level was 6 minutes

(•) Research methods: Fundamental of clinical chemistry:

Scientific coefficients for the tests used:

Equivalence between the two research groups

The researchers made the relevant experimental control to the nature of the research by dividing the research sample into the first experimental group (boxing players) and the second experimental group (rowing players) in order to make the equivalence between the two groups in the pre-measurement of protein metabolism measurements, as shown in the following tables:

Table (3)
The significance of differences of the pre-measurement in the basic measurements between the boxers and rowers

S.	Measurements	Boxers (N = 7)		Rowers (N = 7)		Calculated "T" value	Significance level
		X-	±P	X-	±P		
1	Age (year)	21.29	0.76	21.14	0.69	0.369	0.718
2	Length (cm)	160.43	62.83	183.14	2.12	0.956	0.358
3	Weight (kg)	88.57	4.28	86.71	2.69	0.973	0.350
4	Training age (year)	4.14	0.90	4.43	0.79	0.632	0.539

***Tabular "T" significance at the level of 0.05 = 2.179, ** at the level of 0.01 = 3.055**

Table (3) shows that there are no significant differences in the calculated "T" value of the pre-measurement in the basic measurements between the first experimental group (boxers) and the second experimental group (rowers), which confirms the equivalence between the two research groups of the boxing and rowing players.

Table (4)
The significance of differences of the pre-measurement in the measurements of protein metabolism between the boxers and rowers

S.	Measurements		Boxers (N = 7)		Rowers (N = 7)		Calculated "T" value	Significance level
			X-	±P	X-	±P		
1	Protein (g/ dL)		6.43	0.17	6.42	0.18	0.092	0.928
2	Albumin (g/ dL)		4.11	0.23	4.11	0.23	0.034	0.973
3	Globulin (g/ dL)		2.66	0.04	2.66	0.04	0.207	0.839
4	Antitrypsin (g/ dL)		239.71	18.55	240.00	18.61	0.029	0.978
5	Transferrin (mg/ dL)		210.86	14.48	211.00	14.67	0.018	0.986
6	Haptoglobin (mg/ dL)		163.43	6.32	163.47	6.32	0.013	0.990
7	Immunoglobulin - IG (mg/ dL)	(IgG)	1322.43	96.86	1322.57	96.97	0.003	0.998
		(IgM)	173.07	7.35	173.10	7.31	0.007	0.994

***Tabular "T" significance at the level of 0.05 = 2.179, ** at the level of 0.01 = 3.055**

Table (4) shows that there are no significant differences in the calculated "T" value of the pre-measurement in the measurements of protein metabolism between the first experimental group (boxers) and the second experimental group (rowers), which confirms the equivalence between the two research groups of the boxing and rowing players.

Statistical treatments:

The research data was applied and processed using the IBM SPSS Statistics 20 application using the following statistical processors:

Percentage

Arithmetic mean

Median

Standard deviation

Skewness coefficient

Kurtosis coefficient

T-test for independent samples

"T" value for the differences

Effect size Presentation of the results:

The researchers presented the achieved results after conducting the measurements of protein metabolism to the research sample of boxers and rowers, and further discussion will be elaborated in the light of the scientific references, related studies and the researchers' comments to achieve the objectives and hypotheses of the research through the following tables:

Table (5)

The significance of differences between the pre- and post-measurements of the boxing players in the measurements of protein metabolism (n = 7)

S.	Measurements		Pre-measurement		Post-measurement		Difference		Calculated "T" value	Difference percentage %
			X-	±P	X-	±P	X-	±P		
1	Protein (g/ dL)		6.43	0.17	7.97	0.39	1.54	0.40	10.181**	24.00
2	Albumin (g/ dL)		4.11	0.23	4.21	0.27	0.10	0.08	3.197*	2.47
3	Globulin (g/ dL)		2.66	0.04	2.65	0.03	-0.01	0.00	6.971**	0.48
4	Antitrypsin (g/ dL)		239.71	18.55	276.86	5.58	37.14	17.76	5.533**	15.49
5	Transferrin (mg/ dL)		210.86	14.48	211.71	15.40	0.86	2.54	0.891	0.41
6	Haptoglobin (mg/ dL)		163.43	6.32	161.71	6.94	-1.71	2.36	1.922	1.05
7	Immunoglobulin - IG (mg/ dL)	(IgG)	1322.43	96.86	1381.29	111.76	58.86	32.41	4.805**	4.45
		(IgM)	173.07	7.35	181.11	6.34	8.04	2.91	7.309**	4.65

***Tabular "T" significance at the level of 0.05 = 2.447, ** at the level of 0.01 = 3.707**

Table (5) and Figure (1) show that there are significant differences in the calculated "T" value between the pre- and post-measurements in some measurements of protein metabolism of the boxing players, where the difference ranged between (0.41%, 24%) in favor of the post-measurement of the research sample boxing players.

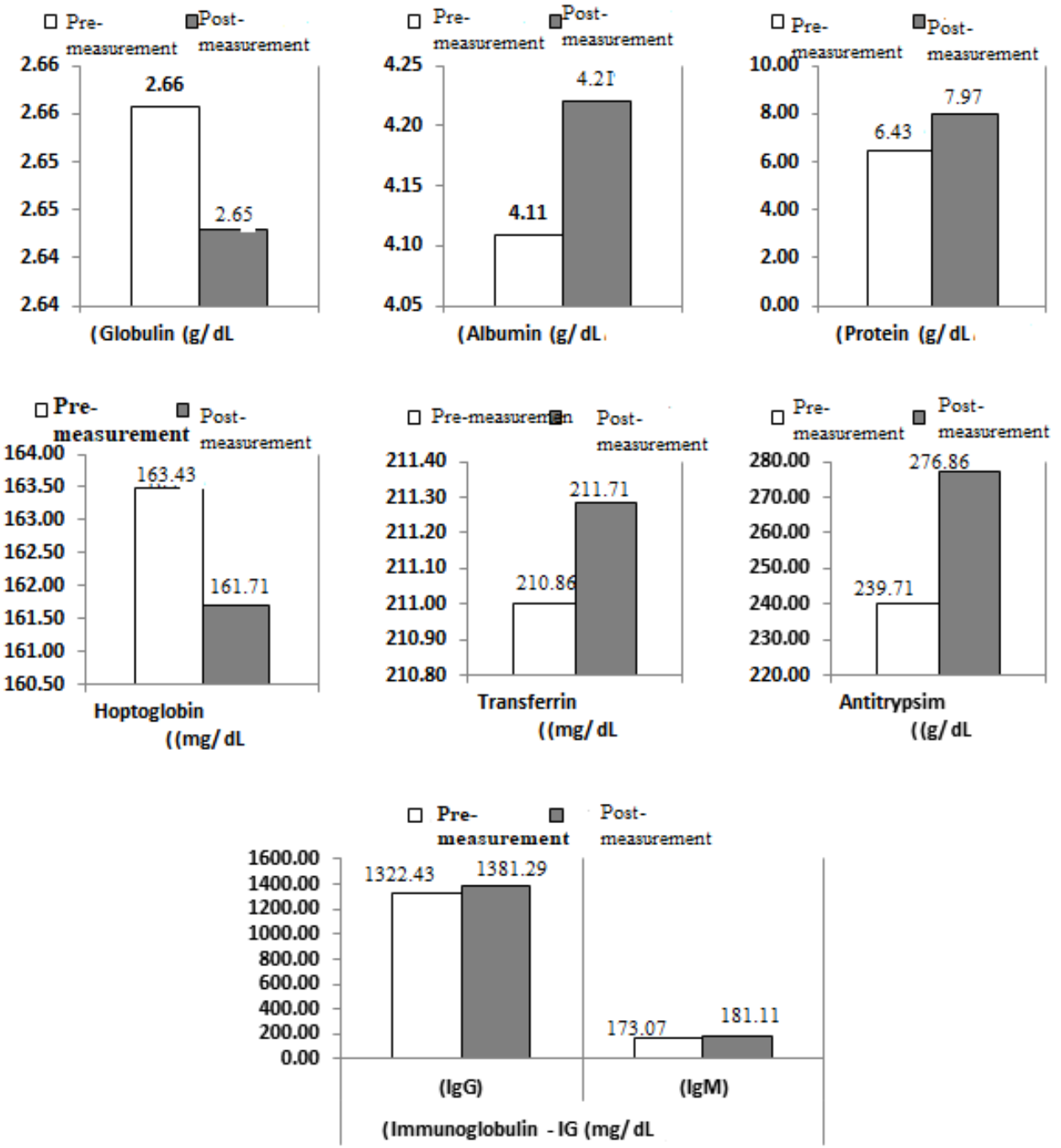

Figure (1)
The arithmetic mean between the pre- and post-measurements of the boxing players in the measurements of protein metabolism

Table (6)
The significance of differences between the pre- and post-measurements of the rowing players in the measurements of protein metabolism (n = 7)

S.	Measurements		Pre-measurement		Post-measurement		Difference		Calculated "T" value	Difference percentage %
			X-	±P	X-	±P	X-	±P		
1	Protein (g/ dL)		6.42	0.18	7.99	0.41	1.57	0.42	9.921**	24.50
2	Albumin (g/ dL)		4.11	0.23	4.22	0.27	0.11	0.09	3.401*	2.71
3	Globulin (g/ dL)		2.66	0.04	2.64	0.04	-0.01	0.01	2.714*	0.48
4	Antitrypsin (g/ dL)		240.00	18.61	277.14	5.87	37.14	17.79	5.524**	15.48
5	Transferrin (mg/ dL)		211.00	14.67	211.29	14.47	0.29	0.49	1.549	0.14
6	Haptoglobin (mg/ dL)		163.47	6.32	161.69	6.94	-1.79	2.41	1.959	1.09
7	Immunoglobulin - IG (mg/ dL)	(IgG)	1322.57	96.97	1381.57	111.73	59.00	32.26	4.838**	4.46
		(IgM)	173.10	7.31	181.16	6.34	8.06	2.83	7.520**	4.65

***Tabular "T" significance at the level of 0.05 = 2.447, ** at the level of 0.01 = 3.707**

Table (6) and Figure (2) show that there are significant differences in the calculated "T" value between the pre- and post-measurements in some measurements of protein metabolism of the rowing players, where the difference ranged between (0.14% and 24.50%) in favor of the post-measurement of the research sample rowing players.

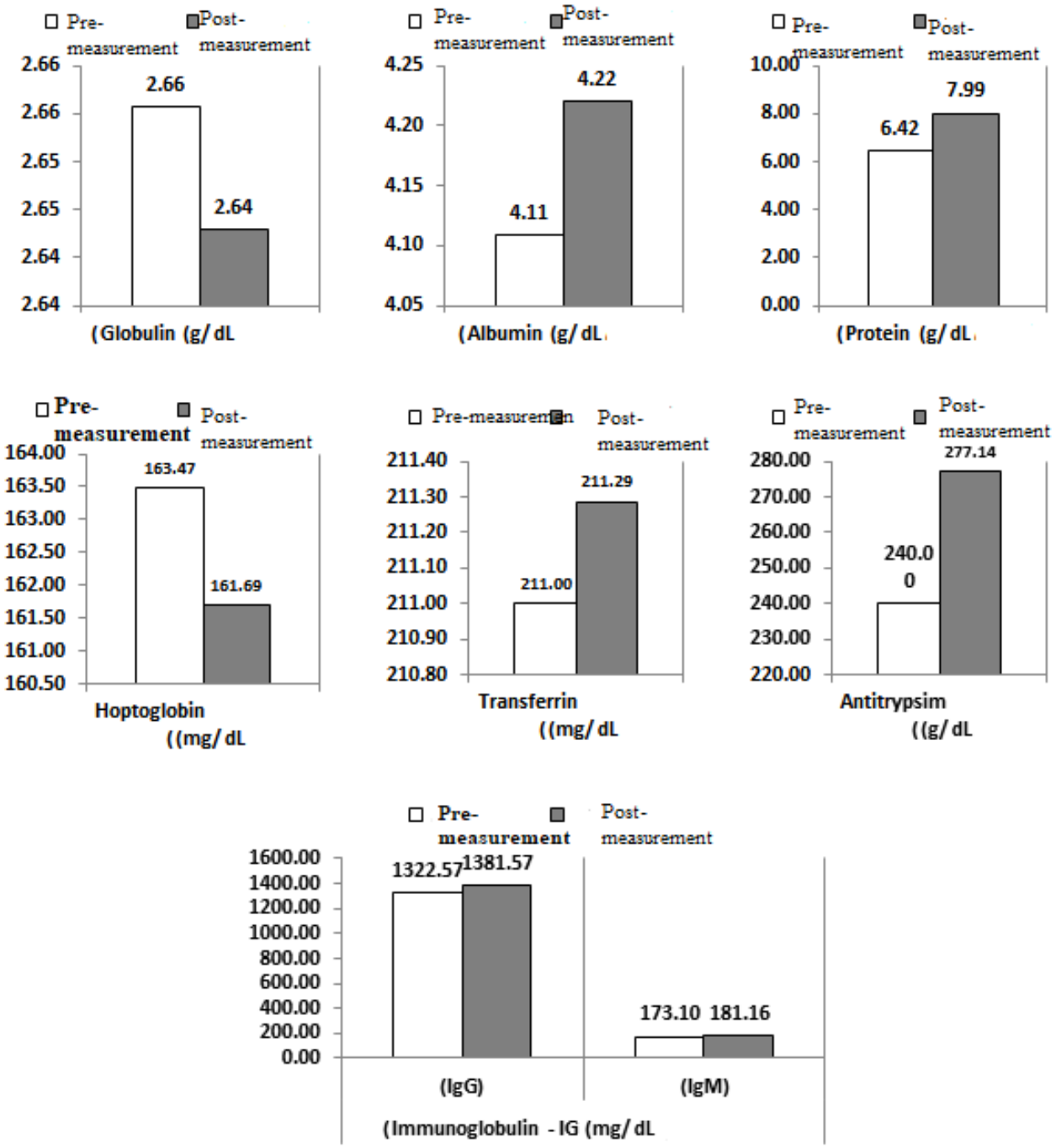

Figure (2)
The arithmetic mean between the pre- and post-measurements of the rowing players in the measurements of protein metabolism

Table (7)
The significance of differences in the post-measurement between the boxing and rowing players in the measurements of protein metabolism

S.	Measurements		Boxers (N = 7)		Rowers (N = 7)		Difference between the means	Difference percentage %	Calculated "T" value
			X-	±P	X-	±P			
1	Protein (g/ dL)		7.97	0.39	7.99	0.41	-0.021	0.268	0.100
2	Albumin (g/ dL)		4.21	0.27	4.22	0.27	-0.006	0.135	0.040
3	Globulin (g/ dL)		2.65	0.03	2.64	0.04	0.004	0.162	0.228
4	Antitrypsin (g/ dL)		276.86	5.58	277.14	5.87	-0.286	0.103	0.093
5	Transferrin (mg/ dL)		211.71	15.40	211.29	14.47	0.429	0.203	0.054
6	Haptoglobin (mg/ dL)		161.71	6.94	161.69	6.94	0.029	0.018	0.008
7	Immunoglobulin - IG (mg/ dL)	(IgG)	1381.29	111.76	1381.57	111.73	-0.286	0.021	0.005
		(IgM)	181.11	6.34	181.16	6.34	-0.043	0.024	0.013

*

Tabular "T" significance at the level of 0.05 = 2.179, ** at the level of 0.01 = 3.055

Table (7) and Figure (3) show that there are no significant differences in the calculated "T" value of the post-measurement between the boxing and rowing players in the measurements of protein metabolism, where the difference ranged between (0.103%, 0.268%) in favor of the rowing players in the measurements of (protein - albumin - antitrypsin - immunoglobulin G), while the difference ranged between (0.018%: 0.203%) in favor of the boxing players in the measurements of (globulin - transferrin - haptoglobin) in the members of the research sample.

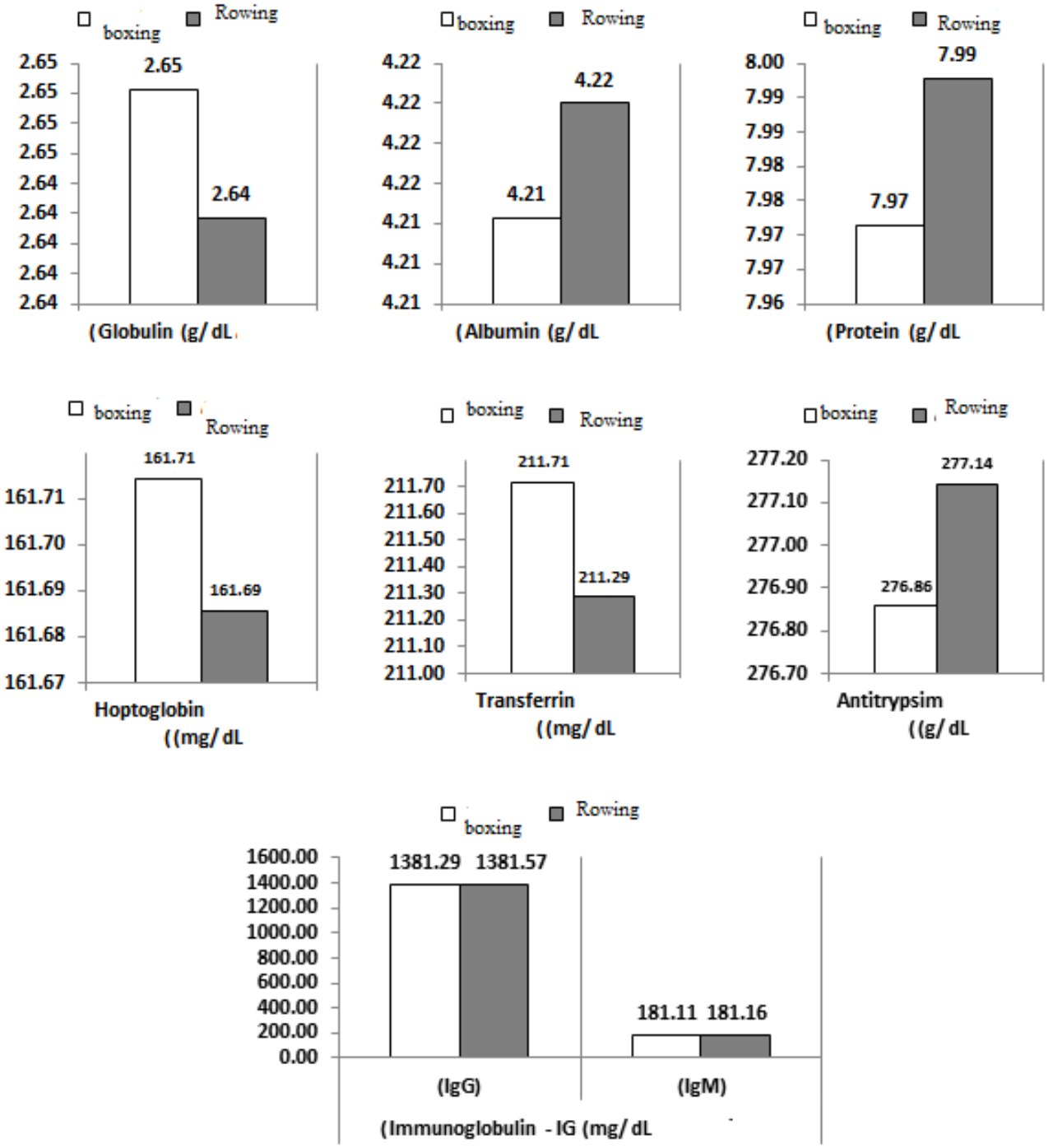

Figure (3)
Arithmetic mean of the post-measurement of the boxing and rowing players in the measurements of protein metabolism

Table (8)
The effect of boxing and rowing on protein metabolism

S.	Measurements		Boxers (N = 7)		Rowers (N = 7)	
			Effect size value	Effect size quantity	Effect size value	Effect size quantity
1	Protein (g/ dL)		5.075	High	4.828	High
2	Albumin (g/ dL)		0.359	Weak	0.401	Weak
3	Globulin (g/ dL)		0.342	Weak	0.306	Weak
4	Antitrypsin (g/ dL)		2.493	High	2.480	High
5	Transferrin (mg/ dL)		0.054	Weak	0.018	Weak
6	Haptoglobin (mg/ dL)		0.250	Weak	0.261	Weak
7	Immunoglobulin - IG (mg/ dL)	(IgG)	0.502	Moderate	0.504	Moderate
		(IgM)	1.106	High	1.112	High

*

Effect size = 0.2 weak, 0.5 moderate, 0.8 high.

Table (8) and Figure (4) show that the effect of sport on protein metabolism for the boxing players ranged between weak and high, where the effect size values ranged between (0.054: 5.075), while the effect size quantity of the rowing players ranged between weak and high with effect size values ranging between (0.018: 4.828), where the effect size was greater for the boxing players in (protein - globulin - transferrin) and it was greater for the rowing players in (albumin - haptoglobin - immunoglobulin G) and that indicates the positive effect of sports on protein metabolism for the boxing and rowing players.

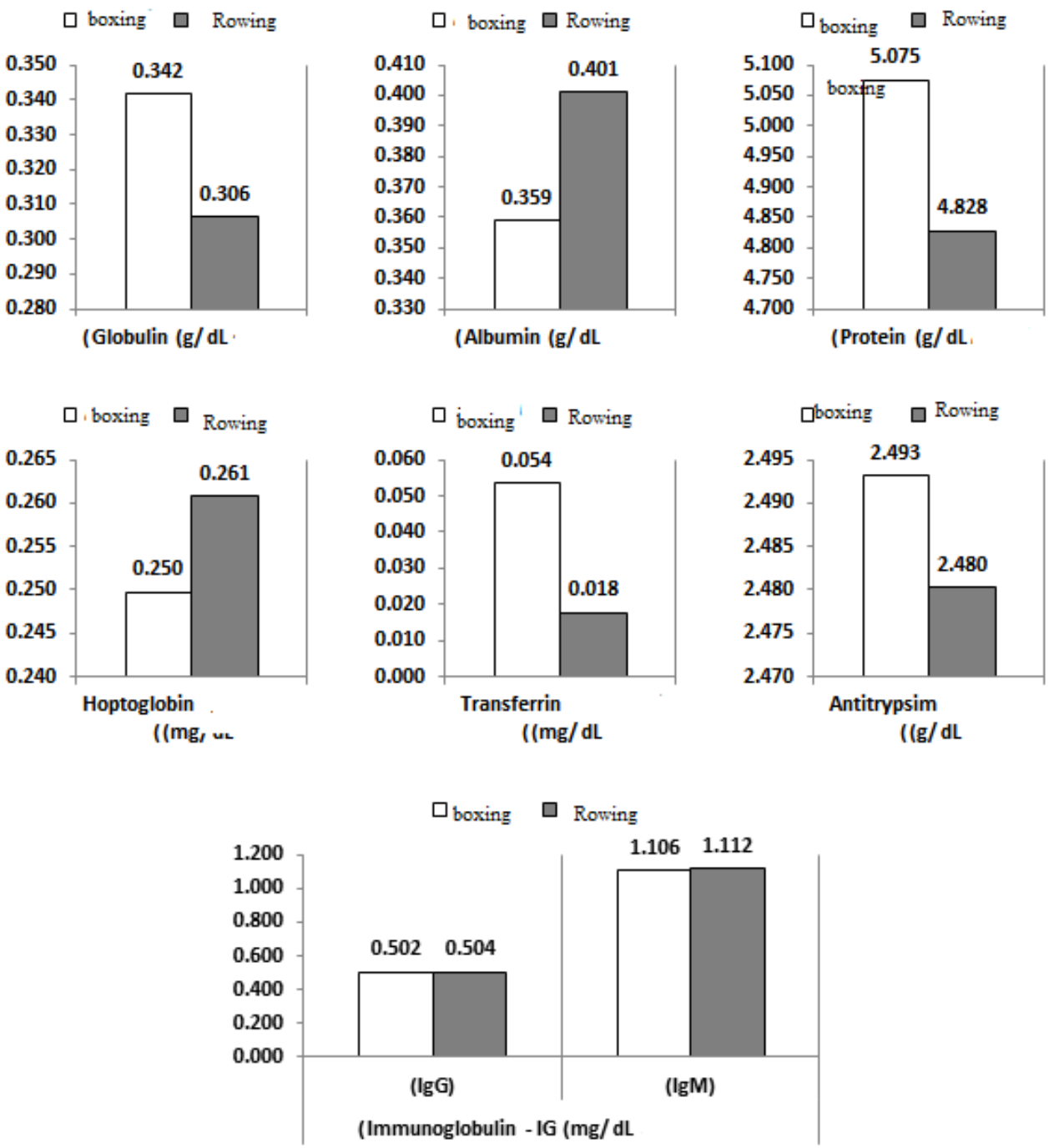

Figure (4)
The effect of boxing and rowing on protein metabolism

Discussion of the results:

In light of the presentation of the results after conducting the measurements of protein metabolism on the research sample of boxers and rowers and conducting the statistical analysis, the previous tables show that there is a discrepancy in the biochemical measurements (protein metabolism) before and after practicing the sports of boxing and rowing.

The tables of (pre- and post-measurements of the boxers) and (effect size) which illustrate the effect of boxing on protein metabolism on the boxing players, as practicing boxing leads to an increase of concentration of protein by (14%), albumin by (2.47%), antitrypsin by (15.49%), transferrin (50.41%) and immunoglobulin (IgG, IgM) by (4.45%, 4.65%), and a decrease of concentration of globulin by (0.48%) and haptoglobin by (1.05%), and the effect of boxing is high on the concentration of (protein, antitrypsin, and IgG) and weak on the concentration of (albumin, globulin, transferrin, haptoglobin) for the boxing players.

The tables of (pre- and post-measurements of the boxers) and (effect size) which illustrate the effect of rowing on protein metabolism on the rowing players, as practicing rowing leads to an increase of concentration of protein by (24.50%), albumin by (2.71%), antitrypsin by (15.48%), transferrin (50.14%), and immunoglobulin (IgG, IgM) by (4.46%, 4.65%), and a decrease of concentration of globulin by (0.48%) and haptoglobin by (1.09%), and the effect of rowing is high on the concentration of (protein, antitrypsin, and immunoglobulin IgG), medium on the concentration of (IgG) and weak on the concentration (albumin, globulin, transferrin, haptoglobin) for the rowing players.

The differences between the effect of boxing and rowing on protein metabolism of the players, as shown in the table of (differences between the boxers and rowers), where the concentration of transferrin increased by (0.054%) in favor of the boxers over the rowers, while the rest of the measurements came in favor of the rowers over the boxers by an increase of concentration of protein by (0.100%), albumin by (0.040%), antitrypsin by (0.093%) and immunoglobulin (IgG, IgM) by (0.005%, 0.013%), and a decrease of concentration of globulin by (0.228%) and haptoglobin by (0.008%) for the rowing players. The excellence and superiority of the rowers over the boxing players in protein metabolism may be due to the longer time of the rowing race than that of the boxing match, and of course, rowers need muscular effort (protein), that's why protein is used more.

From the previously presented results and by comparing the statistical data before and after applying the experimental program, the results of the statistical tables indicate a significant increase in the level of total "protein", "albumin" and "antitrypsin", after matching and multiplicity in the other matters such as "protein plasma", "globulin", "transferrin", "immunoglobulin G", "immunoglobulin M", and "haptoglobin", and after matching, it did not reach statistical significance.

Although the primary function of protein is to contribute to amino acids in various anabolic processes, some proteins, including muscle protein, can be broken down or destroyed to produce energy during exercise, especially if the exercise is practiced for a long period of time. (Bates: 2020) (Lemon and Mullin: 2020) (Rose: 2019) (Kohn: 2018) (Weichselbaum: 2017)

Recent studies have confirmed the separation of "actin" and "myosin" in the trained muscle, the increase of the production of destroyed protein in the urine, in addition to a significant change in the distribution of amino acid in the blood, the oxidation of amino acids to carbon dioxide and water, and in the obvious increase in the secretion of products of the protein breakdown widely. (Dohm and Puente: 2021) (Brodan and Kuhn & et al.: 2020) (Refsum and Gjessing & et al.: 2020) (Lemon and Mullin: 2020) (Lemon and Nagle: 2020) (While and Brook: 2019) (Ronald and Susan: 1999)

In the last 15 years there were some conflicting ideas considering changes in plasma protein during exercise.

The instability of protein plasma were identified after steady state exercises below the maximum, such as two hours of swimming or "50" km of running, and on the other hand, an hour of weightlifting mostly had no effect on plasma proteins, and it seems at first glance that the type of muscle contraction during the exercise affects the instability of plasma protein, also the dynamic muscle exercise actually induces the modification of distributing protein in the blood, while the static muscle activity does not. (Joye and Poortmans: 2021) (Poortmans: 2020) (Poortmans: 2019) (Hawald and Poortmans: 2018) (Van Beaumont: 2010) (Beaumont: 2000)

There is also conflicting data regarding the effect of training and exercise on protein metabolism, and several scientists have clarified that the changes reported in the total plasma content of electrolytes and protein are a result of intensive exercise.

Many scientists also confirmed that long exercise improves the plasma protein level and leads to the redistribution of some proteins. According to the scientists, when someone performs a bike exercise for an hour, we find a statistically high level of "prealbumin", "albumin", "antitrypsin", "macro-globulin", and "immunoglobulin G" (IgG), while

the rest of proteins, "transferrin", "haptoglobin" and "glycoprotein acid", are tested without the occurrence of any change.

When you follow a more intensive exercise such as swimming for two hours or running for a distance of "50" km, the same effect will be observed. (Hara Lambie: 2020) (Poortmans: 2020) (Poortmans: 2019) (Hawald and Poortmans: 2018) (Bichler: 2016) (Van Beaumont: 2010) (Strand: 2001)

The study shows a strict rise in the plasma level of total protein and antitrypsin after exercise, while other proteins such as "globulin, transferrin, immunoglobulin G, immunoglobulin M, and haptoglobin" were tested without the occurrence of any change, and the increase in plasma protein level may be due to the release of protein from sources out of the vascular system, but that belief has no solid basis.

The changes in the level of individual proteins did not develop synchronously, possibly due to unknown mechanisms that preferentially fill some protein plasmas.

In light of the results and the previous comment and interpretation of the scientists, the differences in molecular size, which may affect the rate of spread, is not an appropriate explanation, and by considering "haptoglobin", the results are consistent with the results reported by many scientists. (Munro: 2021) (Hara Lambie: 2020) (Mancini: 2020) (Poortmans: 2020) (Hawald and Poortmans: 2018) (Ritzmann: 2017) (Bichler: 2016) (Strauss: 2013)

Many scientists have noted a significant increase in the level of "albumin" through a statistical table, and that increase was clear in swimming for two hours or running "50" km, also the same effect was observed with more differences in long-distance runners.

They also explained that dynamic muscle activity positively affects the distribution of "proteins" in the blood, in contrary to the static muscle activity, where exercises depend on the intensity of activity more than its duration. (Kirsch and Schultze: 2019) (Werning: 2019) (Bell and Davidson: 2017) (Guyton: 2009) (Thomas: 2008) (Harper: 2005) (Morehouse and Rasch: 2000)

Some scientists have pointed to the differences in the level of "haptoglobin" in the blood serum of long-distance runners who practice and undergo endurance exercises, as there is a clear increase in "plasma protein" as well as the excretion of "plasma proteins" through urine, in light of the flow of "60" minutes of cycling.

Other scientists have indicated that the estimated rate of production of "alanine" by the muscle increases significantly with the intensity of physical activity.

Some studies have indicated that there is an increase in 'urea' in the muscles with the prolongation of muscle activity. (Keul and Doll & et al.: 2020) (Euler: 2019) (Guyton and Hall: 2014) (Kannan: 2014) (Harper and Rodwell & et al.: 2009) (Harvey and Champe: 2008) (Ronald and Susan: 1999)

The researchers believe through their position as trainers, and through the analysis of many national and international championships and races in the sports of boxing and rowing, also based on the comments of many experts on the importance of this research topic, as well as reviewing several specialized scientific references, in addition to conducting many pilot experiments, that the importance of this study lies in: the effect of boxing and rowing on protein metabolism. The researchers also see the importance of supporting the personnel of the educational process and those interested in it, as well as the clubs and coaches, and providing them with the latest outcomes of this research.

Conclusions:

From the above, and after discussing the statistical data, the following points were concluded:

- The level of total protein, albumin, globulin, antitrypsin, transferrin, immunoglobulin G (IgG), immunoglobulin M (IgM) and haptoglobin vary.
- There is an increase in the level of total protein in the blood serum after the experimental program than before.
- There is an increase in the level of albumin in the blood serum after the experimental program than before.
- There is no significant increase in the level of plasma globulin in the blood serum after the experimental program than before.
- There is an increase in the level of antitrypsin in the blood serum after the experimental program than before.
- There is no significant increase in the level of transferrin in the blood serum after the experimental program than before.
- There is no significant difference in the level of immunoglobulin "G" in the blood serum after the experimental program than before.
- There is no significant difference in the level of immunoglobulin "M" in the blood serum after the experimental program than before.

- The mean was low in the level of haptoglobin in the blood serum, but the change was not statistically significant.
- The data of the total research sample was moderate, not scattered, and characterized by a normal distribution of the sample.

Recommendations:

- Measuring the analyses of the research periodically for the boxing and rowing players to find out the efficiency of the heart, muscles and general health.
- Using the measurements or results of this study in other sports.
- Performing antitrypsin, (IgG), (IgM) analyses to determine the level of immunity of the athletes.
- Identifying iron metabolism by measuring transferrin in the blood.
- Conducting further studies on different age groups.

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