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Indications of physiological adaptation of some biochemical variables during the period of special preparation of the boxing and rowing players

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Abstract

This study aims at identifying the effect of physiological adaptation indications of some biochemical variables during the period of special preparation of the boxing and rowing players. The experimental approach was used and the study was conducted on (20) players (10 boxers and 10 rowers) with 10 players in each specialization, and they were purposively selected. The results of this research showed in a significant increase in the level of both "C.P.K" enzyme and "L.D.H" enzyme in the blood serum after the training program, while there was a significant decrease in the level of "lactic acid" and "cholesterol" in the blood serum, after the training program. The researchers recommend measuring the activity level of the enzymes under study with the expansion of the rest of the blood enzymes, as a chemical indicator to determine the level of fitness of boxing and rowing players in particular and the other athletes in general..

Introduction and Research Problem:

Physical education and sports rely on the scientific method in solving problems, and this is reflected in the innovated vision for the development of training programs.

Scientific research in every field of physical education attempts to provide us with the latest information and the best scientific objective codified methods to advance the profession of physical education and sports.

Training problems are considered from the vital problems in the sports field, that's why the training process personnel must have connect knowledge of the sciences that are the basis for modern sports training, such as anatomy, physiology, medical biochemistry... etc. and other important sciences that contribute to raising the level of athletes to the highest level.

Boxing and rowing are sports which involve activities that require high level abilities.

Recently, as we approach the third millennium, the tendency to chemical research in the fields of sports medicine has been observed, especially those that focus on the essential acids in the blood, which are the most important factor that shows the internal environment of the organism.

It is used as a scale to assess the ability of athletes to determine the intensity and persistence of physical activity. Many researchers in Egypt have studied some of these factors, and within the limits of the researchers' knowledge, none of them focused on the biochemical changes resulting from training in the field of boxing and rowing.

The researchers chose some medical biochemical measurements to identify some of the changes in the composition of blood serum that occur in the body of the boxing and rowing players during the training process:

- Measuring the percentage of lactic acid in the blood serum.
- Measuring the percentage of "creatine phosphokinase" enzyme (C.P.K) in the blood serum.
- Measuring the percentage of "lactate dehydrogenase" enzyme (L.D.H) in the blood serum.
- Measuring the percentage of "cholesterol" in the blood serum.

Enzymes are proteins that speed up chemical reactions in vital systems. All chemical reactions of living cells may occur very slowly without enzymes.

It is also the third type (after vitamins and hormones) of naturally occurring auxiliary substances in the body, which are of vital importance and crucial for the continuation of life, it is a colloidal protein with a large molecular weight and it is formed inside the organism and is characterized by its high ability to influence vital reactions even in very small quantities in terms of the speed and direction of the reaction, such as the reactions related to the representation of proteins, carbohydrates and fats, and the effectiveness of enzymes is greatly affected by temperature and the acidity or alkalinity of the medium (Hans Beyer: 2018) (Lot and Stang: 2018) (Hamilton and Whitney: 2015) (Schnohr and Grande: 2014) (Kleiner and Orten: 2010) (Harper & Rodwell et al.: 2000) (Nasset: 1999)

Cholesterol is a well-known fat and is found and spread in all cells of the body, especially in liver cells, and its sources are foods that we eat such as animal fats, and it is a fat that has different chemical and structural characteristics. It is known that people who have a high level of cholesterol in

the blood are liable to coronary artery disease. (Wright and Pincherle et al: 2021) (Tuttle: 2020) (Oser: 2020) (Jennings: 2006) (Cerutty: 2002)

Lactic acid is a substance produced from glucose when the muscles contract, and when this acid increases, it causes a feeling of fatigue, and this fatigue is temporary and end after reducing the intensity of exercise. So, it is better for an athlete to remain mobile than to be stable after completing a difficult race by doing some exercises that result in a decrease in the level of lactic acid in the blood.

The main source of lactic acid is the muscles, and the main substitute for getting rid of it is the liver, where it is converted into glycogen. The accumulation of lactic acid in the blood depends on the relative intensity of exercise. The concentration of lactic acid in the blood varies according to the type and nature of the activity.

During strenuous exercises, you notice that the blood tends to be more acidic and lactic acid accumulates, which changes the chemical balance in the blood, and lactic acid does not appear until after "15" seconds from the beginning of the exercise. (White & Handler et al: 2016) (Martin and Mayes et al: 2015) (Consolazia and Johnson et al: 2003) (Galloway: 2000)

Boxing and rowing are sports that primarily rely on endurance and its components, as well as a high level of intensity, training loads, and training methods used.

Boxing and rowing depends on the effectiveness of the arms' performance, such as the cases of pulling and pushing movements of the paddle, as well as the movements of the legs that complement the performance. (Purge: 2006) (Volker: 2005)

Rowing training devices are also used to develop the boxers' endurance, and the cooperation between boxing and rowing is clear in the transitional period, in which it is possible to practice different activities and make movements of the trunk and shoulder.

The researchers as boxing and rowing trainers and by analyzing many national and international boxing and rowing tournaments, and considering the comments of many experts on the importance of this research topic, as well as reviewing many specialized scientific references, the importance of the study lies in:

The indications of physiological adaptation of some biochemical variables during the period of special preparation of the boxing and rowing players

The researchers also believe that it is important to support those in charge of educational sciences and those interested in it, as well as clubs and coaches, in addition to providing them with the results of this research, since this study may open new horizons for studying and clarifying the biochemical bases during the training process and competitions.

Research Objective:

Identifying the indications of physiological adaptation of some biochemical variables during the period of special preparation of the boxing and rowing players

Research Hypothesis:

- The levels of "lactic acid", "lactate dehydrogenase" enzyme, "cholesterol" and "creatine phosphokinase" enzyme in the blood serum differ from what was before the experimental program.
- The level of concentration of "lactic acid" in the blood serum decreases after the experimental program than before.
- The level of concentration of "lactate dehydrogenase" enzyme in the blood serum increases after the experimental program than before.
- The level of concentration of "cholesterol" in the blood serum decreases after the experimental program than before.
- The level of concentration of "creatine phosphokinase" in the blood serum increases after the experimental program than before.

Research Procedures:

Methodology:

Based on the nature and objectives of the research and the characteristics of the available sample and to check the hypotheses' validity and based on the theoretical study and the reference survey, the researchers used the experimental method for the sample under study and conducted a pre- and post-measurement on it.

Study Sample:

The study was conducted on a sample of boxing and rowing players consisting of (20) twenty players (10 boxers and 10 rowers) with (10) players in each specialization, senior class boxing players "first class", and under "23" years rowing players, the study sample was purposively selected from the boxing and rowing players, and all medical examinations were conducted on the study sample members to ensure the safety of the players' functional devices.

The researchers set some conditions for selecting the study sample:

1. The player must be registered with the Egyptian boxing and rowing federations.
2. The player must have practiced the specialized activity for at least three sports seasons, and participated in the last republic's championship.
3. The boxing players must be at the "first" senior class, and the rowing players under "23" years and still practicing boxing and rowing.
4. Boxing sample was from Al-Nasr Youth Center in Alexandria.
5. Rowing sample was from the Al-Sayd Club in Alexandria.

Spatial domain:

- The experiment was conducted at "Al-Sayd Club" in Alexandria Governorate, under the supervision of the researchers.
- Blood was drawn from the vein in two stages for each of the boxers and rowers under study, at a

rate of "4 cm3" blood in each stage for each player before the experiment and after the experiment on a "rowing ergometer" and after its completion in order to determine the potential biochemical changes that may occur in the body of the boxing and rowing players.

- Blood samples were drawn by (4) laboratory technicians.
- All analyses and medical procedures were carried out by a specialized and certified doctor in "Al-Rahman Laboratory for Medical Analysis and Hematology".
- The players under study were given compensatory drinks immediately after the blood was drawn.

Temporal domain:

This study was conducted in the 2023 training season during the period (from 11/12/2022 to 7/3/2023).

The researchers trained the boxing and rowing sample under study to use the "rowing ergometer" and to help the boxing players reach the rowing players' level of using the "rowing ergometer" until the two groups under study is at the same level in the efficiency of using the device, and the training process lasted for a one whole month.

Research Methods: Fundamental of clinical chemistry:

This encyclopedia was used to conduct all the scientific laboratory analyses, in addition to the tools used to measure all the variables under consideration.

Edited by Narbart, W., Tietz, Wendel, T., Pub., by Saunder, Phi., London, Toronto, Copy. At, 1976.

- Barker & Summerson (Lactic Acid in Blood).

- Wroblewski & Ladue (L.D.H. in serum).

- Swanson & Wilkinson (C.P.K. in serum).

(II)Statistical characterization and homogeneity of the research sample :

The researchers conducted a statistical description of the research sample (boxing and rowing players) to identify the homogeneity between the members of the research sample in the basic measurements and some biochemical variables during the period of special preparation of the boxing and rowing players, as shown in the following tables:

Statistical description of sample

Table (1)
Statistical characterization of the basic measurements of the boxing and rowing players (n = 20)

S.	Basic measurements	Lowest value	Highest value	Arithmetic mean	Median	Standard deviation	Skewness	Kurtosis
1	Age (years)	20	22	21.35	21	0.671	-0.549	0.522
2	Height (cm)	180	186	182.50	182	2.164	0.381	0.231
3	Weight (kg)	84	92	86.45	85.5	2.373	1.317	0.400
4	Training age (years)	3	5	4.25	4.5	0.851	-0.534	-0.294

Table (1) illustrates the lowest and highest values, the arithmetic mean and the standard deviation of the basic measurements, and 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 the values, and the homogeneity of the members of the research sample of boxing and rowing players.

Table (2)
Statistical characterization of some biochemical variables during the period of special preparation of the boxing and rowing players (n = 20)

S.	Basic measurements	Lowest value	Highest value	Arithmetic mean	Median	Standard deviation	Skewness	Kurtosis
1	Lactic acid (mg %)	11	15	13.10	13	1.119	-0.466	0.089
2	Lactate dehydrogenase enzyme (L.D.H.) (u/L)	231	248`	239.20	241.5	5.926`	-0.224	-0.388
3	Cholesterol (mg %)	210	228	215.05	214.5	4.774	2.114	0.115
4	Creatine phosphokinase enzyme (C.P.K.) (u/L)	14	24	18.00	18	3.356	0.241	0.000

Table (2) illustrates the lowest and highest values, the arithmetic mean and the standard deviation of some biochemical variables during the period of special preparation, and 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 the values, and the homogeneity of the members of the research sample of boxing and rowing players.

Table (3)
Statistical characterization of some physical measurements of the boxing and rowing players (n = 20)

S.	Basic measurements	Lowest value	Highest value	Arithmetic mean	Median	Standard deviation	Skewness	Kurtosis
1	Speed distance test (m)	115	121	117.75	118	1.552	0.182	-0.161
2	Maximum ability test (sec.)	89.3	96.2	92.57	92.5	2.188	0.127	0.032
3	500m time test (sec.)	88.6	96.5	92.63	92.8	1.924	-0.193	-0.088
4	2000m time test (sec.)	400.3	406.8	404.48	404.65	1.937	-0.822	-0.088

Table (3) illustrates the lowest and highest values, the arithmetic mean and the standard deviation of some physical measurements, and 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 the values, and the homogeneity of the members of the research sample of boxing and rowing players.

III) Parity between the two research groups

The researchers conducted the appropriate experimental control which is relevant 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) and confirmed the parity between the two groups in the pre-measurement in the basic, the physical measurements and some biochemical variables during the period of special preparation of the boxing and rowing players, as shown in the following tables:

Table (4)
Significance of differences of the pre-measurement of the basic measurements between the boxing and rowing players

S.	Measurements	Boxing players (N=10)		Rowing players (N=10)		Calculated "t" value
		X-	±P	X-	±P	
1	Age (years)	21.40	0.70	21.30	0.67	0.325
2	Height (cm)	182.40	2.41	182.60	2.01	0.201
3	Weight (kg)	86.70	2.45	86.20	2.39	0.461
4	Training age (years)	4.20	0.92	4.30	0.82	0.256

* Tabular "t" significant at the level of 0.05 = 2.101, ** at the level of 0.01 = 2.878

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

Table (5)
Significance of differences of the pre-measurement of some biochemical variables during the period of special preparation of the boxing and rowing players

S.	Measurements	Boxing players (N=10)		Rowing players (N=10)		Calculated "t" value
		X-	±P	X-	±P	
1	Lactic acid (mg %)	13.00	1.05	13.20	1.23	0.391
2	Lactate dehydrogenase enzyme (L.D.H.) (u/L)	239.30	6.22	239.10	5.95	0.073
3	Cholesterol (mg %)	215.20	4.89	214.90	4.91	0.137
4	Creatine phosphokinase enzyme (C.P.K.) (u/L)	17.90	3.25	18.10	3.63	0.130

* Tabular "t" significant at the level of 0.05 = 2.101, ** at the level of 0.01 = 2.878

Table (5) shows that there are no significant differences in the calculated "t" value of the pre-measurement of some biochemical variables during the period of special preparation between the first experimental group (boxers) and the second experimental group (rowers), which indicates the parity between the two research groups of boxing and rowing players.

Table (6)
Significance of differences of the pre-measurement of some physical measurements between the boxing and rowing players

S.	Measurements	Boxing players (N=10)		Rowing players (N=10)		Calculated "t" value
		X-	±P	X-	±P	
1	Speed distance test (m)	118.00	1.56	117.50	1.58	0.711
2	Maximum ability test (sec.)	92.39	2.08	92.75	2.39	0.359
3	500m time test (sec.)	93.16	1.64	92.10	2.12	1.250
4	2000m time test (sec.)	405.23	1.14	403.73	2.32	1.836

* Tabular "t" significant at the level of 0.05 = 2.101, ** at the level of 0.01 = 2.878

Table (6) shows that there are no significant differences in the calculated "t" value of the pre-measurement of some physical measurements during the period of special preparation between the first experimental group (boxers) and the second experimental group (rowers), which indicates the parity between the two research groups of boxing and rowing players.

Statistical treatments:

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

- Percentage
- Arithmetic mean
- Median
- Standard deviation
- Skewness
- Kurtosis
- "t" test for independent samples
- "t" value for the differences
- Eta squared
- Effect size

Presentation and discussion of the results:

The researchers presented the results that were obtained after applying the measurements of some biochemical and physical variables during the period of special preparation of the boxing and rowing players, and the results will be discussed in the light of scientific references and related studies.

I) Presentation and discussion of the results of some biochemical variables during the period of special preparation of the boxing and rowing players variables during the period of special preparation of the boxing and rowing players

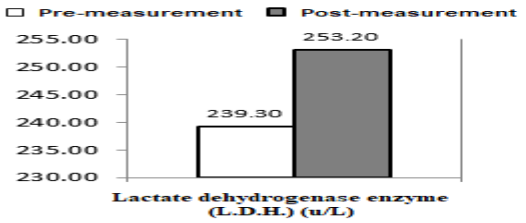
Table (7)
Significance of differences between the pre- and post-measurements of some biochemical variables during the period of special preparation of the boxing players (n = 10)

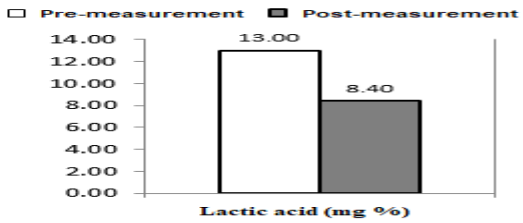
S.	Measurements	Pre-measurement		Post-measurement		Difference		Calculated "t" value	Difference percentage %
		X-	±P	X-	±P	X-	±P		
1	Lactic acid (mg %)	13.00	1.05	8.40	1.35	-4.60	1.51	9.66**	35.38
2	Lactate dehydrogenase enzyme (L.D.H.) (u/L)	239.30	6.22	253.20	3.74	13.90	7.23	6.08**	5.81
3	Cholesterol (mg %)	215.20	4.89	208.60	3.13	-6.60	6.83	3.05*	3.07
4	Creatine phosphokinase enzyme (C.P.K.) (u/L)	17.90	3.25	27.00	1.49	9.10	2.64	10.89**	50.84

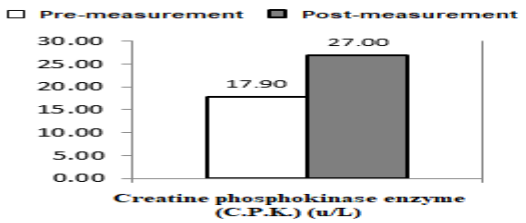
* Tabular "t" significant at the level of 0.05 = 2.262, ** at the level of 0.01 = 3.250

Table (7) and Figure (1) show that there are significant differences in the calculated "t" value between the pre- and post-measurements of some biochemical variables during the period of special preparation of the boxing players, where the difference percentage ranged between (3.07%, 50.84%) in favor of the post-measurement of the research sample of boxing players.

Figure (1) Arithmetic mean between the pre- and post-measurements of some biochemical variables during the period of special preparation of the boxing players







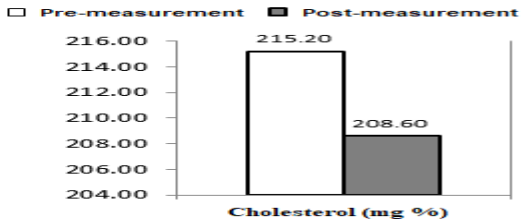


Table (8)

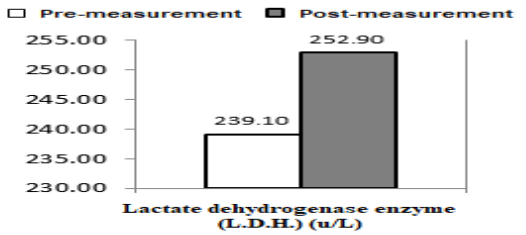
Significance of differences between the pre- and post-measurements of some biochemical variables during the period of special preparation of the rowing players (n = 10)

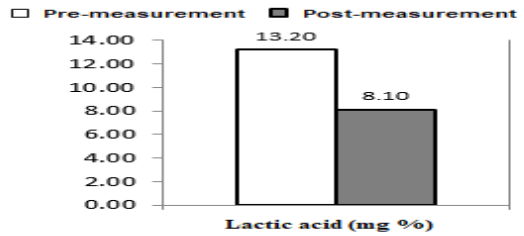
S.	Measurements	Pre-measurement		Post-measurement		Difference		Calculated "t" value	Difference percentage %
		X-	±P	X-	±P	X-	±P		
1	Lactic acid (mg %)	13.20	1.23	8.10	1.29	-5.10	1.45	11.13**	38.64
2	Lactate dehydrogenase enzyme (L.D.H.) (u/L)	239.10	5.95	252.90	3.78	13.80	7.11	6.13**	5.77
3	Cholesterol (mg %)	214.90	4.91	209.00	5.42	-5.90	3.45	5.41**	2.75
4	Creatine phosphokinase enzyme (C.P.K.) (u/L)	18.10	3.63	26.80	2.53	8.70	1.89	14.57**	48.07

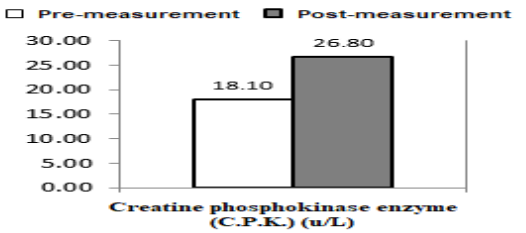
* Tabular "t" significant at the level of 0.05 = 2.262, ** at the level of 0.01 = 3.250

Table (8) and Figure (2) show that there are significant differences in the calculated "t" value between the pre- and post-measurements of some biochemical variables during the period of special preparation of the rowing players, where the difference percentage ranged between (2.75%, 48.07%) in favor of the post-measurement of the research sample of boxing players.

Figure (2) Arithmetic mean between the pre- and post-measurements of some biochemical variables during the period of special preparation of the rowing players







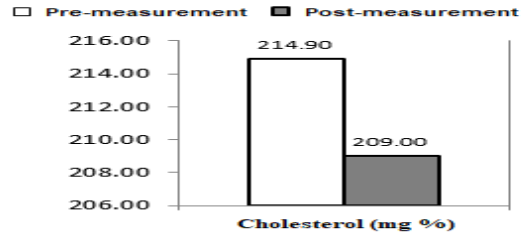


Table (9)

Significance of differences in the post-measurement of some biochemical variables during the period of special preparation of the boxing and rowing players

S.	Measurements	Boxing players (N=10)		Rowing players (N=10)		Difference between the two means	Difference percentage %	Calculated "t" value
		X-	±P	X-	±P			
1	Lactic acid (mg %)	8.40	1.35	8.10	1.29	0.30	3.70	0.509
2	Lactate dehydrogenase enzyme (L.D.H.) (u/L)	253.20	3.74	252.90	3.78	0.30	0.12	0.178
3	Cholesterol (mg %)	208.60	3.13	209.00	5.42	-0.40	0.19	0.202
4	Creatine phosphokinase enzyme (C.P.K.) (u/L)	27.00	1.49	26.80	2.53	0.20	0.75	0.215

* Tabular "t" significant at the level of 0.05 = 2.101, ** at the level of 0.01 = 2.878

Table (9) and Figure (3) show that there are no significant differences in the calculated "t" value between the post-measurements of some biochemical variables during the period of special preparation of the boxing and rowing players, where the difference percentage ranged between (0.12%, 3.70%), and the highest means of the boxing players were in the variables of (lactate dehydrogenase – creatine phosphokinase enzyme), while the highest means of the rowing players were in the variables of (lactic acid – cholesterol) for the research sample of boxing and rowing players**.**

Figure (3) Arithmetic mean of the post-measurement of some biochemical variables during the period of special preparation of the boxing and rowing players

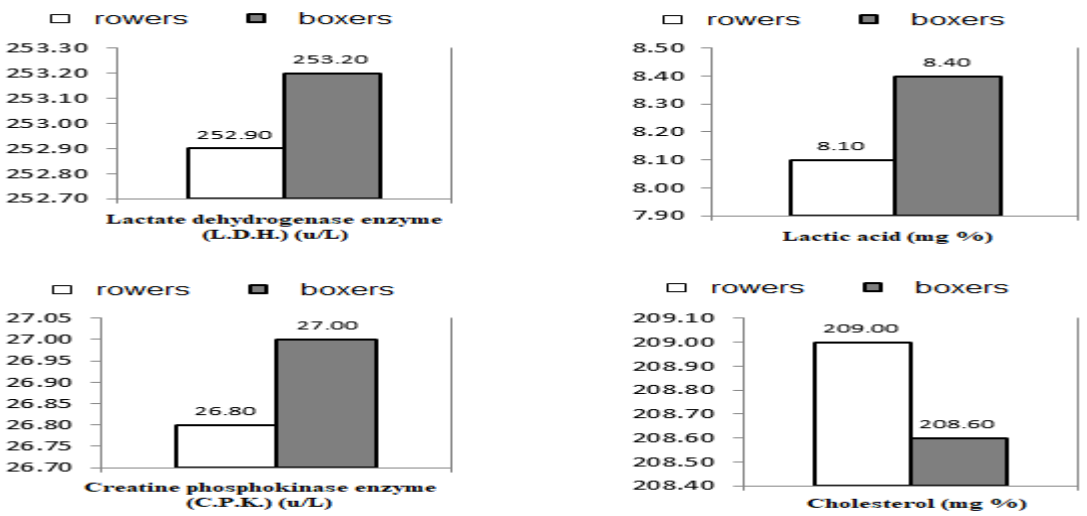


Table (10)

Effect size of Eta squared of the sports of boxing and rowing of some biochemical variables during the period of special preparation of the boxing and rowing players

S.	Measurements	Boxing players (N=10)			Rowing players (N=10)		
		Eta squared	Effect size value	Effect size magnitude	Eta squared	Effect size value	Effect size magnitude
1	Lactic acid (mg %)	0.912	3.78	High	0.932	4.05	High
2	Lactate dehydrogenase enzyme (L.D.H.) (u/L)	0.804	2.71	High	0.807	2.77	High
3	Cholesterol (mg %)	0.509	1.63	High	0.765	1.13	High
4	Creatine phosphokinase enzyme (C.P.K.) (u/L)	0.929	3.09	High	0.959	2.33	High

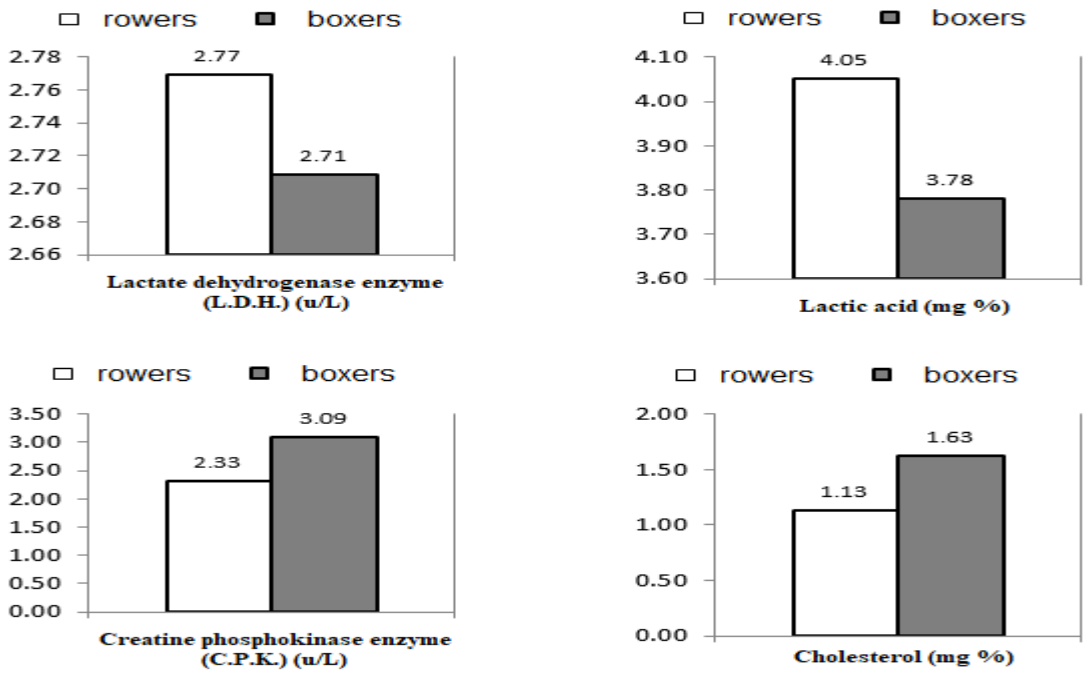
* Eta squared = less than 0.09 weak, greater than 0.14 high

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

Table (10) and Figure (4) show the effect of boxing and rowing on some biochemical variables during the period of special preparation of the boxing and rowing players, where the effect size of boxing was high and ranged between (1.63 : 3.78) and the values of Eta squared ranged between (0.509: 0.929), and the effect size of rowing was high too, as it ranged

between (1.13: 4.05), and the values of Eta squared ranged between (0.765: 0.959), which indicates the positive impact of boxing and rowing on some biochemical variables during the period of special preparation of the boxing and rowing players**.**

Figure (4) Effect size of boxing and rowing of some biochemical variables during the period of special preparation of the boxing and rowing players



II) Presentation and discussion of the results of some physical measurements during the period of special preparation of the boxing and rowing players

Table (11)

Significance of differences between the pre- and post-measurements of some physical measurements during the period of special preparation of the boxing players (n = 10)

S.	Measurements	Pre-measurement		Post-measurement		Difference		Calculated "t" value	Difference percentage %
		X-	±P	X-	±P	X-	±P		
1	Speed distance test (m)	118.00	1.56	120.50	1.08	2.50	1.08	7.32**	2.12
2	Maximum ability test (sec.)	92.39	2.08	90.28	2.11	-2.11	0.77	8.64**	2.28
3	500m time test (sec.)	93.16	1.64	91.46	1.70	-1.70	0.66	8.19**	1.82
4	2000m time test (sec.)	405.23	1.14	403.11	1.09	-2.12	0.98	6.87**	0.52

* Tabular "t" significant at the level of 0.05 = 2.262, ** at the level of 0.01 = 3.250

Table (11) and Figure (5) show that there are significant differences in the calculated "t" value between the pre- and post-measurements in some physical measurements during the period of special preparation of the boxing players, where the difference percentage ranged between (0.52%, 2.28%) in favor of the post-measurement of the research sample of boxing players.

Figure (5) Arithmetic mean between the pre- and post-measurements in some physical measurements during the period of special preparation of the boxing players

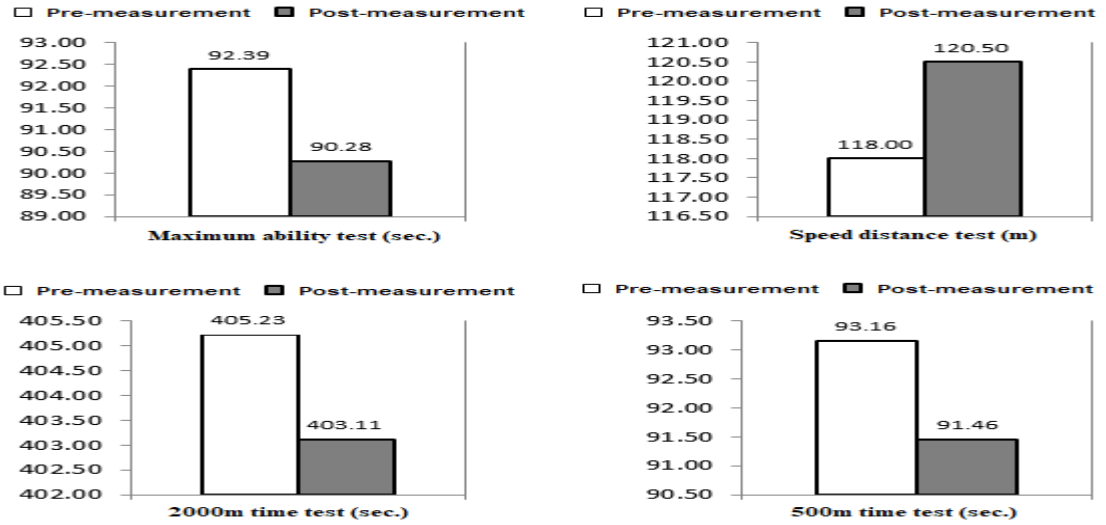


Table (12)

Significance of differences between the pre- and post-measurements of some physical measurements during the period of special preparation of the rowing players (n = 10)

S.	Measurements	Pre-measurement		Post-measurement		Difference		Calculated "t" value	Difference percentage %
		X-	±P	X-	±P	X-	±P		
1	Speed distance test (m)	117.50	1.58	118.70	1.34	1.20	1.62	2.34*	1.02
2	Maximum ability test (sec.)	92.75	2.39	91.76	2.27	-0.99	1.15	2.73*	1.07
3	500m time test (sec.)	92.10	2.12	90.66	2.10	-1.44	1.07	4.27**	1.56
4	2000m time test (sec.)	403.73	2.32	401.65	2.13	-2.08	0.99	6.63**	0.52

* Tabular "t" significant at the level of 0.05 = 2.262, ** at the level of 0.01 = 3.250

Table (12) and Figure (6) show that there are significant differences in the calculated "t" value between the pre- and post-measurements in some physical measurements during the period of special preparation of the rowing players, where the difference percentage ranged between (0.52%, 1.56%) in favor of the post-measurement of the research sample of rowing players**.**

Figure (6) Arithmetic mean between the pre- and post-measurements in some physical measurements during the period of special preparation of the rowing players

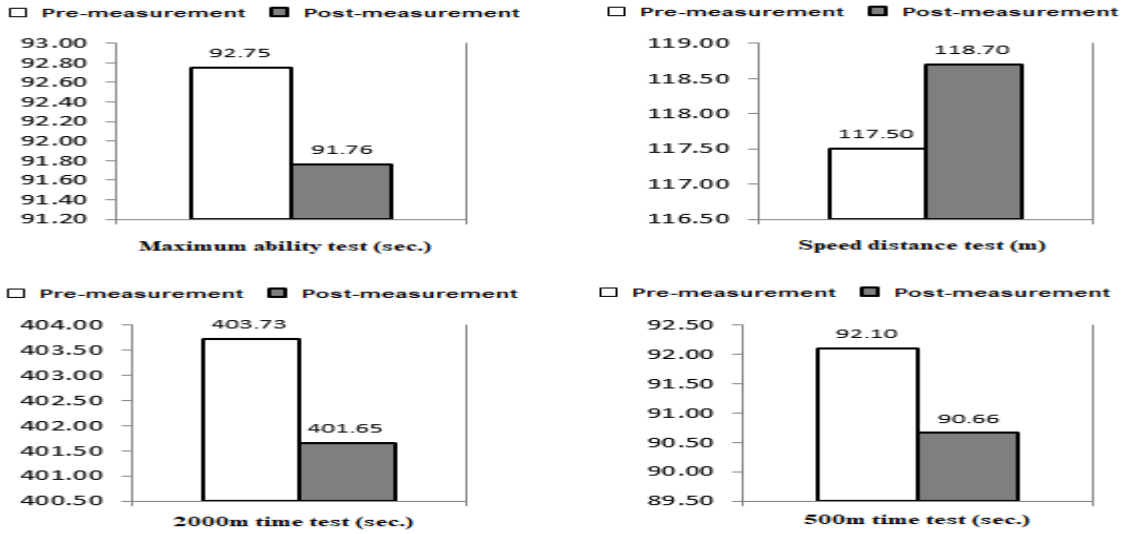


Table (13)
Significance of differences in the post-measurement of some physical measurements during the period of special preparation of the boxing and rowing players

S.	``Measurements	Boxing players (N=10)		Rowing players (N=10)		Difference between the two means	Difference percentage %	Calculated "t" value
		X-	±P	X-	±P			
1	Speed distance test (m)	120.50	1.08	118.70	1.34	1.80	1.52	3.31**
2	Maximum ability test (sec.)	90.28	2.11	91.76	2.27	-1.48	1.61	1.51
3	500m time test (sec.)	91.46	1.70	90.66	2.10	0.80	0.88	0.936
4	2000m time test (sec.)	403.11	1.09	401.65	2.13	1.46	0.36	1.93

* Tabular "t" significant at the level of 0.05 = 2.101, ** at the level of 0.01 = 2.878

Table (13) and Figure (7) show that there are no significant differences in the calculated "t" value between the post-measurement in some physical measurements during the period of special preparation of the boxing and rowing players, and the difference percentage ranged between (0.36%, 1.61 %), where the boxing players exceeded in the measurements of (speed distance test – maximum ability test) while the rowing players exceeded in the measurements of (500m time test – 2000m time test) for the research sample of boxing and rowing players.

Figure (7) Arithmetic mean of the post-measurement of some physical measurements during the period of special preparation of the boxing and rowing players

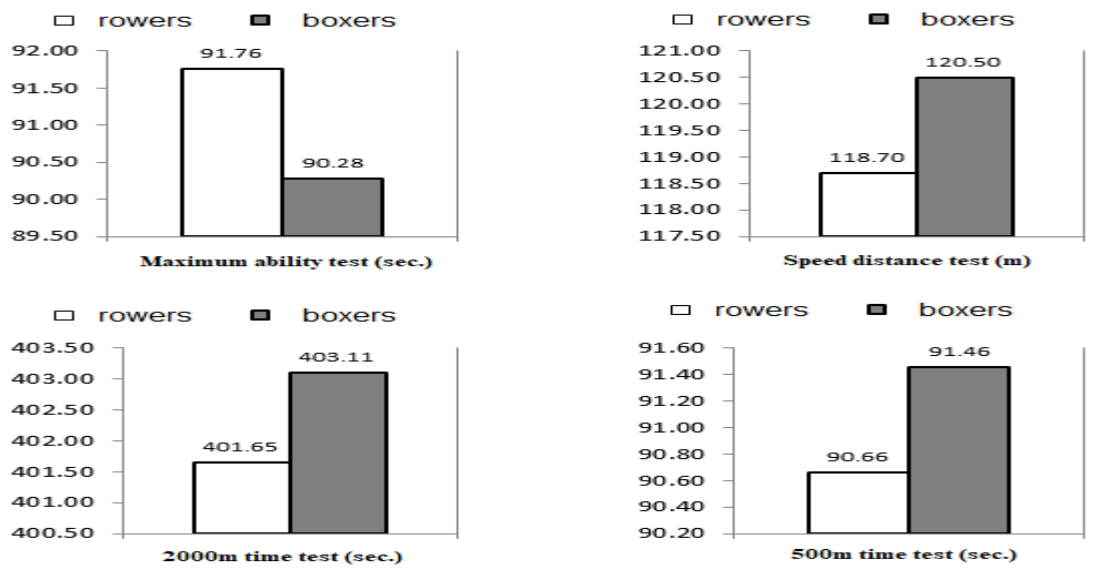


Table (14)
Effect size of Eta squared of the sports of boxing and rowing in some physical measurements during the period of special preparation of the boxing and rowing players

S.	Measurements	Boxing players (N=10)			Rowing players (N=10)		
		Eta squared	Effect size value	Effect size magnitude	Eta squared	Effect size value	Effect size magnitude
1	Speed distance test (m)	0.856	1.72	High	0.379	0.82	High
2	Maximum ability test (sec.)	0.892	1.00	High	0.452	0.42	Weak
3	500m time test (sec.)	0.882	1.01	High	0.669	0.68	Moderate
4	2000m time test (sec.)	0.840	1.90	High	0.830	0.92	High

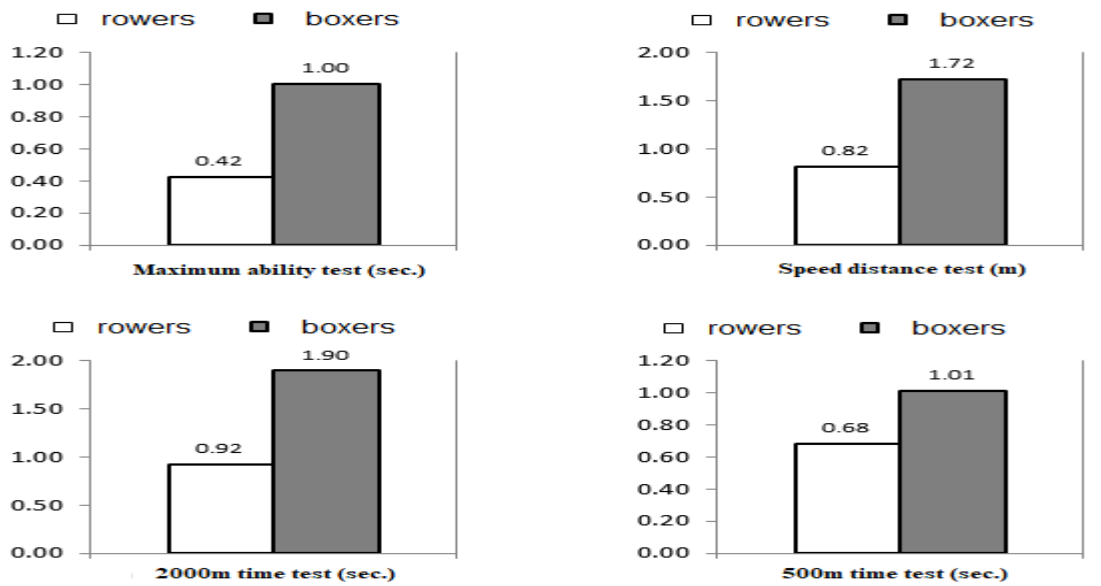
* Eta squared = less than 0.09 weak, greater than 0.14 high

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

Table (14) and Figure (8) show the effect of boxing and rowing on some physical measurements during the period of special preparation of the boxing and rowing players, where the effect size of boxing was high and ranged between (1.00 : 1.90) and the values of Eta squared ranged between (0.509: 0.929), and the effect size of rowing was high too, as it ranged

between (1.13: 4.05), and the values of Eta squared ranged between (0.452: 0.830), which indicates the positive impact of boxing and rowing on some biochemical variables during the period of special preparation of the boxing and rowing players**.**

Figure (8) Effect size of boxing and rowing of some physical measurements during the period of special preparation of the boxing and rowing players



Discussion of the results:

After the presentation of the results of the biochemical variables during the period of special preparation of the boxing and rowing players, as shown in the previous tables which illustrated the indications of physiological adaptation resulting from the effect of boxing and rowing on the players during the period of special preparation, where the percentage of improvement ranged between (3.07%, 50.84%) for the boxing players, while the percentage of improvement ranged between (2.75% and 48.07%) for the rowing players, and the difference percentage between the boxing and rowing players ranged between (0.12%, 3.70%), where the boxing players exceeded in the variables of (lactate dehydrogenase enzyme – creatine phosphokinase enzyme), while the rowing players exceeded in the variables of (lactic acid – cholesterol), the effect was in favor of the boxing players in the variables of (cholesterol, creatine phosphokinase enzyme) and in favor of the rowing players in the variables of (lactic acid, lactate dehydrogenase).

After the presentation of the results of some physical measurements during the period of special preparation of the boxing and rowing players, as shown in the previous tables which illustrated the indications of physiological adaptation resulting from the effect of boxing and rowing on the physical abilities of the players during the period of special preparation, where the percentage of improvement ranged between (0.52%, 2.28%) for the boxing players, while the percentage of improvement ranged between (0.52%, 1.56%) for the rowing players, and the difference percentage between the boxing and rowing players ranged between (0.36%, 1.61%), where the boxing players exceeded in the measurements of (Speed distance test – Maximum ability test) while the rowing players exceeded in the measurements of (500m time test – 2000m time test), and the effect was in favor of the boxing players in all measurements.

The results mentioned above, the comparison outcomes of the statistical data before and after the application of the training program, the results of the statistical tables show a significant decrease in both "lactic acid" and "cholesterol", while the rest of the results of the statistical tables show a significant increase in lactate dehydrogenase and creatine phosphokinase enzymes. Many scientists have confirmed that lactic acid produced by the skeletal muscles begin to appear in the blood during and after intense efforts.

It is known that the maximum increase of "lactic acid" in the blood that results from the intense physical exertion may reach about 1.12 grams per kilogram of body weight, and it must be clear that intense exercises depend not only on oxygen, but on "lactic acid" and other substances somehow, and these chemical changes generate the necessary energy to support the muscles in exerting continuous activity, also, sports exercise lead to reducing the level of lactic acid.

The low rate of "lactic acid" indicates an improvement in biochemical efficiency, and in the case of intense muscular exercise, the rate of "lactic acid" in the blood reaches "100" milligrams, and the intensity and persistence of work has an effect on the level of "lactic acid". (Reith: 2021) (Euler:

2019) (Lippold and Winton: 2018) (Hermansen and Mehlum et al: 2015) (Kannan: 2014) (Montoye: 2001)

Many scientists agree that athletes are characterized by lower levels of "lactic acid" in the blood during and after performing exercises, compared to non-athletes, that is because the athletes have the ability to adhere muscular activity for a long time with a high level of "lactic acid".

The decrease in "lactic acid" may be due to the fact that the training program has led to an improvement in the blood circulation of the muscles, which resulted in an improvement in the supply of oxygen to them. Therefore, the process of glucose oxidation is carried out by the aerobic pathway through the "Krebs cycle" "C.A.C", and thus the formed "lactic acid" during training decreases. (Bell and Davidson et al: 2019) (Phillis: 2016) (Harper: 1998)

Many researches have shown that during exercise, whether they are short or long-term, the level, secretion, oxidation and composition of cholesterol may change, and when the exercises take long and intense periods at the same time, it may lead to a decrease in the amount of "cholesterol" in the blood. Older people have a lower level of "cholesterol" in the blood than people who are new in sports.

Some scientists have explained that exercise has a lowering effect on the level of cholesterol in the blood, while other scientists explained the importance of intense activity, and explained that "cholesterol" levels are low in some workers who are engaged in tasks that require using the muscles, some other scientists have proven that physical activity leads to a notable decrease in the rate of "cholesterol" in the blood serum, in the meantime other group of scientists agreed that exercise reduces the level of "cholesterol" in the blood, and that organized training programs cause a decrease in the level of "cholesterol". (Kirsch and Schultze: 2019) (Euler: 2019) (Guyton and Hall: 2014) (Harvey and Champe et al: 2008)

It is clear from the above statistical presentation of "cholesterol" that many studies and laboratory experiments have shown that sports training has a positive effect on reducing the rate of "cholesterol" in the blood serum. Intense exercise for long periods of time in the framework of a structured training program may lead to a decrease in the level of "cholesterol" in the blood serum.

The low level of "cholesterol" in the blood serum of the research sample under study is due to the obtained energy through the oxidation of free fatty acids and the depletion of Cetyle CoA within the C.A.C, which leads to a decrease in the rate of "cholesterol" in the blood. (Wright and Pincherle et al: 2021) (Sorb, Bray et al: 2018) (Paul: 2010) (Thomas: 2008) (La Place: 2008) (Yudkin: 2005)

Many scientists have found that after a long-term human training, there was an increase in the activity of "L.D.H" with 21%, and after a training program that lasted for weeks, and it was found that there was less activity of "L.D.H" in the skeletal muscles.

An increase in the activity of "L.D.H" was observed as a result of the effect of sports training, especially endurance training, and in a research conducted on the national rowing team champions of the German Federal Government to participate in the European Ship Competition in the period 1971-1973, medical examinations confirmed the strong relationship between the increase in blood fluid enzymes (C.P.K & L.D.H), training intensity and the player's condition even among highly trained rowers, and the partial increase of C.P.K after the measurement and performance of the exercise was due to hypoxia and cyanosis.

The information and facts, according to what was reported by some scientists, have proven that the activity of the serum "L.D.H & C.P.K" has increased after performing physical exercises.

The significant increase in the level of the "L.D.H" enzyme of the members of the study sample due to the increase of activity of "L.D.H" as a result of the increased need for energy, as the state inside the cell is anaerobic and the "pyruvic acid" "P.A." is converted to "lactic acid' "A.T.P" to obtain energy.

$$\text{Pyruvate} + \text{NADH2} \underset{}{\overset{\text{L.D.H}}{\rightleftharpoons}} \text{Lactate} + \text{NAD}$$

(Dixon and Webb et al: 2021) (Gornall: 2021) (Hall and Giese et al: 2021) (Reith: 2021) (Oser: 2020) (Data and Ottoway: 2019) (Hans Beyer: 2018) (Thomas: 2008)

The increase in the level of the "C.P.K" enzyme in the blood serum after the application of the training program than in the pre-measurement of the members of the research sample is due to the increased need of the body to the formation of "A.T.P" to use it in generating energy, and this "A.T.P" consists of the effect of the "C.P.K" enzyme on "A.T.P."

$$\text{A.D.P.} + \text{Cr} \sim \text{P.} \underset{}{\overset{\text{C.P.K}}{\rightleftharpoons}} \text{A.T.P.} + \text{Cr}$$

$$\text{A.D.P.} + \text{PC} \underset{}{\overset{\text{C.P.K}}{\rightleftharpoons}} \text{A.T.P.} + \text{Creatine}$$

After discussing the results and the statistical tables of this study, it is clear that the research sample under study has the ability to store and retain energy in the form of "A.T.P" & "C.P", and the boxing and rowing players under study can use energy easily during the tournament or competitions, and this reflects the efficiency of "L.D.H" & "C.P.K" enzymes for the energy of the rowers, which gives an indication that the fitness level of the research sample members of boxing and rowing players under study is good.

Conclusions:

- The levels of lactic acid, C.P.K, L.D.H and cholesterol in the blood serum were different after applying the experimental program than before applying it.
- The level of "lactic acid" in the blood serum decreased right after the experimental program from its level before applying it.
- The level of "C.P.K" enzyme in the blood serum increased right after the experimental program from its level before applying it.
- The level of "L.D.H" enzyme in the blood serum increased right after the experimental program from its level before applying it.
- The level of "cholesterol" in the blood serum decreased right after the experimental program from its level before applying it.

- There was a discrepancy in the physical measurements between the boxers and the rowers.
- The data of the total research sample was moderate, not scattered, and was characterized by a normal distribution.

Recommendations:

- Measuring the level of activity of the "creatine phosphokinase" "C.P.K" and "lactate dehydrogenase" "L.D.H" enzymes as chemical indicators to determine the level of physical fitness of boxing and rowing players in particular and athletes in general.

- Determining the intensity or load of training by biochemical measurements.

- Conducting further field research to identify some biochemical changes by mixing different training methods.

- Conducting more similar studies on the rest of sports in order to determine the training case and evaluate the training plans.

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