Scholar's Digest- Journal of Multidisciplinary Studies
Volume 3, Issue 7, July - 2024
ISSN (E): 2949-8856
Scholarsdigest.org

THE EFFECT OF COMPLEX SKILL EXERCISES ON SOME BIOCHEMICAL VARIABLES AND SPEED OF SKILL PERFORMANCE FUTSAL FOOTBALL

Hussein Abdul Ghaffar Jawad
University of Basra
pgs.hussein.abdulghaffar2@uobasrah.edu.iq

Prof. Dr. Ammar Jasim Muslim
University of Basra

Abstract
The complex exercises in the game of futsal football are of great importance in changing the style of play, creating gaps, and penetrating competitors' defense. At the same time, they have different repercussions on the biochemical variables, as each exercise has effects, perhaps positive or negative, according to the rules, properties, and features of that exercise and its psychological, physical, physiological, and physical content. The researchers believe that complex exercises have a positive impact on the internal environment of athletes. The problem of the research is that the researchers sought to prepare complex skill exercises, since the game of indoor football depends on the phosphate and lactic systems for the most part, which can be developed through these exercises through the complexity, speed, and difficulty of the exercise with Determine the performance time In addition to the great pressure due to the small area of the indoor football field and the large monitoring of the players, it requires improving the speed of performance, and it requires improving the physical and skill capabilities, which can be gained through the complex exercises prepared by the researchers. The researcher sought to prepare complex skill exercises for the players of Al-Shabab Al-Basri Futsal Club for the season (2023-2024). Identifying the differences between the chemical variables before and after performing the experimental variable for the research sample. The researchers assumed that complex skill exercises with the stomach have a positive effect on the research sample. There are also differences between the chemical variables before and after the performance of the experimental variable for the research sample. The researcher used the experimental method as it is the best method to solve the research problem most important conclusions were that the complex skill exercises had a positive role in developing the speed of skill performance, and this is what was indicated by the significant differences between the pre- and post-tests of the experimental group.

Keywords: complex skill exercises - biochemical variables - speed of skill performance.

Introduction

The purpose of the training curricula and the structure and different levels of physical, skill and tactical exercises it contains in all events and games is to improve the technical level, achieve achievement and reach the platform of sports tournaments, and this only happens through the coaches' knowledge of the theory and application of their specializations and the

employment of various sciences that support the science of training. Mathematics, including physiology, chemistry, and tests. According to the scientific research methodology, that is, collecting raw values into meaningful values that can be used to reach meanings that enhance strengths and address weaknesses. Compound exercises in futsal are of great importance in changing the style of play, creating gaps, and penetrating competitors' defenses.

At the same time, it has different repercussions on biochemical variables, as each exercise has effects, perhaps positive or negative, according to the rules, properties and features of that exercise and its psychological, physical, physiological and physical content. The researchers believe that complex exercises have a positive effect on the internal environment of athletes, which reflects the elimination of excess weight, and this must be reflected in the technical performance of the players, including the speed of performance, which is one of the official rules on which indoor football performance depends. The researchers sought to prepare complex skill exercises, since the game of futsal football depends on the phosphate and lactic systems for the most part, which can be developed through these exercises.

Through the complexity, speed, and difficulty of the exercise, while determining the time of performance, in addition to the great pressure due to the small area of the football field for the halls, and the large monitoring of the players, it requires improving the speed of performance, and it requires improving the physical and skill capabilities, which can be gained through the complex exercises prepared by the researchers, as well as the nature of The experimental variable and its duration will reflect some of the variables addressed by the researchers that are related to continuing performance at the same speed and strength during the match time

The objective of the study :

-1 Preparing complex skill exercises for Al-Shabab Al-Basri Futsal Club players for the season (2023-2024).

2 Identify the differences between the chemical variables before and after the performance of the experimental variable for the research sample.

3 Identify the differences in the speed of skill performance before and after implementing the experimental variable for the research sample

Methods and structure of the study

Epermental approach to the problem

The researcher used the experimental method to suit the solution of the research problem. So experimentation, as defined by (Kmeisterwer) (as an approved and controlled change to the specific conditions of an incident and observing and interpreting the resulting changes in the incident itself). (Marwan Abdel Majeed Ismail: 2002: 130)

Participants

The research population was determined by Al-Shabab Al-Basri Futsal Club players who are registered in the federation's lists (15) players and participants in the Iraqi Futsal Professional League for the season (2023-2024). The sample was chosen intentionally and amounted to

(10) players, with a percentage of (75%). The sample was divided into Two groups in a random manner with the most competitive players after being questioned by the coach. The experimental group: the players who were subjected to the coach's traditional approach as well as the experimental variable prepared by the researcher. The control group: the players who were subjected to the coach's approach.

Procedure

1 Means of collecting information - sources and references - information network - tests and measurement
2- Lenovo laptop
3- Laser discs.
4- Electronic stopwatch (2).
5- Canon video camera
6- Futsal stadium and hall
7- A device for measuring blood sugar (spectrophotometer)
8- Spectrophotometer device for measuring triglycerides
9- Insulin measuring device
10- Cortisol measuring device (Ichroma2)
11-Centrifuge device to separate blood serum.
12- A diagnostic kit (Kit) from the United Medical Company, of Chinese origin, to detect the hormone cortisol
13- Diagnostic kit (Kit) from the German company Roche to detect the hormone insulin
14- Medical syringes, size (5 cm3), number (100).
15- Plastic tubes (Plan Test Tubes), number (20) + Edt type tube, number (20).
16- Medical gloves (10).
17- (Rake) A rack used to stabilize sample tubes. Number (20).
18- Medical cotton and sterile alcohol (White Spirit).
19- Box for storing and transfusing blood

Measures

The measurements and tests used in the research were conducted before and after physical effort, before implementing the experimental variable and after the experimental variable by the researcher, as follows:

Biochemical measurements

Biochemical variables were measured by drawing an amount of blood amounting to (5 cc) from venous blood by the specialist () before and after physical exertion. It is placed in plastic tubes, numbered, and kept in a box for transport to the (Chemical Analysis Center) to measure both (the hormone insulin, Cortisol hormone, blood sugar, cumulative blood sugar, triglycerides)

Skill performance speed test (2) (Maytham Jabbar Matar: 2010: 77)

Purpose of the test: To measure the speed of skill performance

Used equipments :-
- Football number 6
- A specific area in which to conduct the test
- Playground area of 10 square metres
-stopwatch
- Whistle

Performance method: The tester stands at a distance of 10 m. When the whistle is heard, the player begins handling the ball to the wall at maximum speed for 15 seconds.
Registration method: Calculating the number of handlings

Experimental variable

The researchers prepared a set of complex skill exercises, numbering (20) individual and group exercises that end with shooting at the target. The researchers emphasized the performance according to the time factor, that is, the intensity between...
(maximum and less than maximum), that is, according to the aerobic system (phosphate and lactic) and the aerobic system that is compatible with the characteristics, advantages and requirements of the futsal game. The experimental variable was applied for a period of (8) weeks at a rate of (3) units per week starting from the date of 4/15/2024. Until 6/16/2024, the time duration of the experimental variable in the training unit was between (35-45) minutes, and it is part of the main section of the training unit, which is implemented in the special preparation stage. The researchers may show a model of the experimental variable in the appendices.
Tribal measurements
On April 15, 2024, pre-tests were conducted for the research sample at four o'clock in the afternoon at the Al-Shabab Al-Basri Club stadium. The tests were conducted according to the following mechanism:
1- Biochemical variables at rest and after exertion
1- Insulin
2- Cortisol
3- Triglycerides
4- Blood sugar
5- Cumulative blood sugar
2- Skill performance speed test
Posttests
On 6/16/2024, at exactly four o'clock in the afternoon, tests were conducted at the Al-Shabab Al-Basri Club stadium. The tribal tests were carried out with the same mechanism, and the researchers sought to maintain the same spatial and temporal conditions.

The result	t	After effort for the control group		Before the effort for the control group		Units	Indicators
		standard	mean	standard	mean		
Insignificant	1.447	2.03	81.5	2.05	82	Mg/dL	Sugar(RBS)
Insignificant	0.552	0.19	4.94	0.17	5	%	Cumulative sugar
Insignificant	1.622	2.50	166	2.45	145.29	Nmol/L	Cortisol
Insignificant	0.205	1.15	10.7	1.75	12.06	Miu/mL	Insulin
Insignificant	2.557	2.23	99.8	1.90	104.58	MG/dL	Triglyceride
The result	t	After effort for the control group		Before the effort for the control group		Units	Indicators
		standard	mean	Standard	mean		
Moral	3.468	1.65	80	2.13	83	Mg/dL	Sugar(RBS)
Insignificant	0.932	0.67	5.28	0.17	5	%	Cumulative sugar
Insignificant	2.414	2.55	165	2.90	154.44	Nmol/L	Cortisol
Insignificant	1.222	1.02	9.06	1.45	13	Miu/mL	Insulin
Insignificant	0.559	1.95	111.2	2.07	119.88	MG/dL	Triglyceride

Analyses
1arithmetic mean
2 standard deviation
3T-test for correlated samples
4T-test for uncorrelated samples

Results

Schedule(1)

It shows the arithmetic means, standard deviations, and the calculated (T) value for the biochemical variables before and after the physical effort in the pre-measurement before implementing the experimental variable for the control and experimental groups.

*The tabular T value is (2.776) at a degree of freedom (4) and a significance level (0.05)

It is clear from Table No. ( ) that there are no statistically significant differences between the chemical measurements and tests before and after the effort before the experimental variable, with the exception of blood sugar. The researcher believes that although there are no significant differences between the two tests, the arithmetic means indicate the presence of chemical responses among the players of the two groups and they are proportional. With the effort performed, it requires an increase in the level of the stress hormone cortisol, which is what happened in both samples, as well as a decrease in the level of the hormone insulin due

to the high intensity used in the effort, which indicates a healthy functional response to the exploitation of blood sugar, which requires a decrease in insulin in the blood.

This is what Tariq Salah El-Din confirms about (Williper): "Physical load at an intensity of 80% of maximum oxygen consumption leads to a decrease in blood glucose levels." In addition, physical effort affects the utilization of triglycerides, which are a source of energy. The researcher also believes that the changes accompanying physical effort indicate the efficiency of the functional systems and the nervous system controlling the hormonal system, which made the levels of blood sugar, cumulative sugar, insulin hormones, cortisol, and triglycerides, despite the physical effort, within the normal limits in the internal environment and consistent with the physical effort, as the resulting increase In the internal environment, it is proportional to what is caused or required by the external load, and this is what the study of (Muhammad Abdullah) showed

The increase that occurred after physical effort, in which the volume, intensity, and repetitions increased in the research sample, which requires the cells and functional systems to respond to that external load" (Muhammad Abdullah Sayhoud: 2013: 119)

4-5 Presentation, analysis and discussion of the differences in biochemical measurements after the physical effort of the two measurements

Pre and post for the control and experimental groups.

The result	T	Post-measurement of the control group		Pre-measurement for the control group		Units	Indicators
		standard	mean	standard	mean		
Mg/dL	Sugar(RBS)	1.70	83	2.03	81.5	Mg/dL	Sugar(RBS)
%	Cumulative sugar	0.66	5.66	0.19	4.94	%	Cumulative sugar
Nmol/L	Cortisol	2.85	155	2.50	166	Nmol/L	Cortisol
Miu/mL	Insulin	1.09	9	1.15	10.7	Miu/mL	Insulin
MG/dL	Sugar(RBS)	2.25	87.8	2.23	99.8	MG/dL	Sugar(RBS)
The result	T	Posttest for the experimental group		Pre-measurement for the experimental group		Units	Indicators
		Standard	mean	Standard	mean		
Mg/dL	Sugar(RBS)	1.50	81	1.65	80	Mg/dL	Sugar(RBS)
%	Cumulative sugar	0.44	5.67	0.67	5.28	%	Cumulative sugar
Nmol/L	Cortisol	2.80	140	2.55	165	Nmol/L	Cortisol
Miu/mL	Insulin	0.99	7	1.02	9.06	Miu/mL	Insulin
MG/dL	Sugar(RBS)	2.05	80	1.95	111.2	MG/dL	Sugar(RBS)

It is clear from Table No. () that there are significant differences in the hormones insulin, cortisol, and triglycerides, and there were no differences in cumulative sugar and blood sugar in both groups. The researcher believes that the functional and chemical responses caused by the experimental variable and the traditional approach had a positive impact on the

experimental and control groups, which caused the functional systems and blood system to adapt to the physical effort in a way that the level of the two hormones (insulin and cortisol) was controlled and controlled within normal limits and in a manner consistent with the physical effort and the internal environment. For athletes. In addition to a decrease in triglycerides, which shows the extent of benefit from the energy system (fats) during the training units and in a controlled manner after converting food materials into harmful fats in the body. This is consistent with Al-Kilani's study.

Which shows that the high training load, training curricula, and various physical exercises according to energy production systems work to oxidize and decompose fats) (Hashim Adnan Al-Kilani: 1992: 95)

The researcher agrees with the study of Mensink (1992: 27) that triglycerides consist of three molecules of fatty acid with one molecule of glycerol, which is the form in which fats are stored in adipose tissue.

When individuals undergo an effort or training program on a regular basis, the need for energy appears, and triglycerides are broken down into their components. The fatty acid molecule is transported through the blood to the muscles to produce energy instead of storing it or removing it through the liver.

The researcher also believes that the adaptation that occurred due to the performance of both the experimental variable and the traditional approach had an impact on improving the control mechanisms for controlling the internal environment within its fixed limits, including blood sugar and cumulative blood sugar. Performing 8 weeks at a rate of 3 training units per week and complex skill exercises that are compatible with the characteristics of the game of football. Walking in the halls with their different systems was also a reason, as physical effort has its requirements that it imposes on the body, but the researcher believes that the good level of the research sample made the changes, despite the differences, within the scope of control and indicating functional efficiency and high physical fitness. As shown (Stanliey W., 1996) That sports training

Organized training curricula lead to functional and physical adaptations in response to physical loads, leading to an increase in the level of physical fitness and improving the efficiency of the player's internal systems."

The researcher explains the decrease in the level of cortisol in the physical effort post-test after the experimental and traditional variables for the two samples by the effectiveness of the exercises used, which led to a gradual increase in metabolism, which led to a slight decrease in the level of cortisol. "The level of the hormone cortisol in the blood decreases during sports activities if Low or high metabolism of energy sources. (Muhammad Hassan and Abu Al-Ala: 200: 161)

The researcher also explains the decrease in the insulin level of the two groups by the high effectiveness of physical effort and the high level of the hormone glucagon, which opposes insulin and thus lowers the insulin level. This is what Youssef Lazem and Saleh Bashir point out: "The hormones that raise the level of sugar in the blood are multiple, including glucagon, which is produced by Alpha cells in the pancreas and has an opposite role to insulin, as it raises glucose levels through hydrolysis of liver glycogen.

Schedule(2)
Indicators, units, control group, experimental group, result
Sugar (RBS) Mg/dL 83 1.70 81 1.50 2.931 Significant
Cumulative sugar % 5.66 0.66 5.67 0.44 0.022 Not significant
Cortisol Nmol/L 155 2.85 140 2.80 0.195 Not significant
Insulin Miu/mL 9 1.09 7 0.99 0.857 Not significant
Triglycerides MG/dL 87.8 2.25 80 2.05 1.523 Not significant

It shows the arithmetic means, standard deviations, and the calculated (T) value for the biochemical variables after physical effort in the post-measurement (after implementing the training curriculum) for the control and experimental groups.

The result	T	Measurement Post-test for the control group		Pre-measurement for the control group		Units	Indicators
		Standard	mean	standard	mean		
Moral	2.931	1.50	81	1.70	83	Mg/dL	Sugar(RBS)
Insignificant	0.022	0.44	5.67	0.66	5.66	%	Cumulative sugar
Insignificant	0.195	2.80	140	2.85	155	Nmol/L	Cortisol
Insignificant	0.857	0.99	7	1.09	9	Miu/mL	Insulin
Moral	1.523	2.05	80	2.25	87.8	MG/dL	Sugar(RBS)

* The tabular value of (T) is equal to (2.306) at a degree of freedom (8) and a significance level (0.05)

It is clear from Table No. () that there are significant differences between blood sugar measurements in favor of the experimental group, while no differences occurred between the other variables, which are insulin, cortisol, triglycerides, and cumulative sugar.

The researcher believes that before talking about the reasons for the differences or their absence, it must be made clear that the level of the research sample was of a high level, and the chemical changes were positive but slight, and the prepared curriculum and the complex skill exercises it contained were prepared on the basis of the energy systems (phosphate, lactic, and oxygenic).

In terms of intensity and time of performance, and heart rate also had an impact on improving the chemical variables and maintaining their level within normal limits after the experimental variable for both groups. Qasim Hassan Hussein asserts, “The selection of physical exercises that constitute the content of the training units in terms of achieving the goal and purpose of developing the type of physical or skill characteristic through the regular and purposeful movements achieved is based on mechanical, anatomical, physiological and skill bases for

the possibility of raising physical, functional and skill efficiency and speed of performance" (Razzaq Zaghir: 2023: 142-155)

While the researcher believes that although there are no significant differences in most of the chemical variables between the two groups, the arithmetic means indicate a decrease in the concentration of the hormone insulin, and this indicates a decrease in its activity because the body does not need it during physical effort, and a decrease in the hormone cortisol, which indicates that the tests are compatible with the research sample. In a way that does not cause tension and stress in them, but rather indicates the presence of motivation in performance and competition during performance. Also, the decrease in cortisol increases the sensitivity of the cells to insulin, which is considered one of the healthy responses of athletes and increases their job efficiency, and this is what agrees with Raysan Khouribet Majeed.

Sports effort increases the rate of blood sugar intake by the muscles to a large extent, and therefore the increase in sugar intake can be explained by the extent to which active muscles need it, "and cortisol and fatty acids in the blood, which can lead to an increase in the excretion of sugar from the liver to compensate for the decrease in its percentage" (Raysan Khouribet Majeed (1997: 109)

In addition to the decrease in the concentration of triglycerides, which is one of the positive indicators of not storing them, which causes negative effects on the body and thus the occurrence of functional, chemical and hormonal changes due to the physical loads and the internal changes they cause, as Muhammad Hassan and Abu Al-Ala Ahmed state, "Repeating physical pregnancy for several weeks includes changes. Functional and structural as a result of training so that these changes enable the body to respond more easily" (Muhammad Hussein and Abu Al-Ala: 1996: 13)

It shows the arithmetic means, standard deviations, and t-value calculated in the pre- and post-test of speed of skill performance for both the experimental and control groups.

indication	) T (	Posttest		Pretest		the group	variable
		Standard	mean	standard	mean		
Moral	2.058	1.65	13.7	0.83	10.4	Experimental	Skill performance
Moral	1.554	1.58	12	1.14	11.2	Female officer	

*The tabular (t) value under the degree of freedom (4) at the significance level (0.05) = 2.776

It is clear from Table No. (4) the arithmetic means and standard deviations for the results of the pre- and post-tests for the variable speed of skill performance in futsal, which the members of the research sample underwent for the experimental and control groups, and in favor of the post-tests. The researcher also sees that the positive changes occurring in the speed of skill performance among the players of the two groups with... The changes occurring in their functional indicators are shown in Table No. (4)

And the chemical variables are shown in Table (3). As the researcher believes, this is consistent with the changes in the time of the tests and the energy systems, especially (phosphate and lactic) shown in Table 2). The researcher attributes this development to the

exercises prepared by the researcher for the experimental group, as well as the training curriculum followed by the coach used with the control group. The good and advance planning of the training program prepared according to correct scientific foundations and appropriate to the players' abilities has a clear impact on achieving the goals of the training process for which it was prepared.

This is confirmed by (Abdullah Al-Lami: 2004: 138) that "the curriculum is a pre-planning process for sports training, as planning for sports training processes is considered one of the important and necessary foundations to ensure work to raise the sports level."

Likewise, Muwaffaq Majeed and Kadhim Al-Rubaie confirm, "One of the most important foundations for athletic progress and improvement in level depends on the progress of the intensity of the loads that the players carry out during their implementation of the training curriculum" (Mwafaq Majeed Al-Mawla and Kazem Al-Rubaie: 1980: 241)

The player's mastery of basic skills prompts him to practice and play with greater enthusiasm, and to reach the highest technical levels, and to be a trump card in the hands of his coach to implement his ideas and plans during official competitions. He points out that (Allawi, 1992) "and to complete mastery of motor skills, as it is the ultimate goal of the skill preparation process." It is based on reaching the highest levels of sports. No matter how high the level of physical characteristics of an individual athlete, and no matter how much of his moral and voluntary traits, he will not achieve the desired results unless all of this is linked to mastery of sports motor skills in the type of sports activity.

"The specialty in which he specializes"

(Dunia Najat Rasheed: 2021: 342–356)

The researcher also attributes the development occurring in the research variables to the players' physical and skill abilities and their previous experiences and information in enhancing good skill performance, in addition to the feedback and error correction processes that the player obtains during exercise, as they complement the players' abilities in achieving the required motor performance with high fluidity, especially in the game Futsal football has many variables during performance, such as fast running, changing direction, deception, creating a vacuum, and the like. All of this requires quick thinking and making the appropriate decision, or through the guidance of the coach, as quickly as possible.

This is what is emphasized by (Ezzat Mahmoud Kashif: 1991) that "achieving high-level achievements requires an appropriate and continuous amount of physical and skill preparation."

As for the control group, which used the method used in training, the development achieved was to a lesser degree than the development obtained by the experimental group in the variable speed of skill performance in the research.

(Youssef Lazem: 2002: 46) confirms that undertaking the training process to raise the level and achieve achievement is no longer random, but has become dependent on planning according to scientific foundations and using training methods and means in order to achieve the physical, functional and skill goals."

Table (5) It shows the arithmetic means, standard deviations, and t-value calculated in the posttest skill performance speed test for both the experimental and control groups.

indication	t	Control group		Experimental group		variable
		Standard	mean	standard	mean	
Moral	0.459	1.58	12	1.65	13.7	Skill performance

*The tabular (t) value under the degree of freedom (8) at the significance level (0.05) = 2.306

It is clear from Table No. (5) the arithmetic means and standard deviations for the results of the post-test for the variable speed of skill performance in futsal, which the members of the research sample underwent for the experimental and control groups, and in favor of the experimental group. The researcher sees the reason for the differences occurring in the speed of skill performance, in favor of the experimental group, as a result of the exercises. The complex skill prepared by the researcher, which is based on the factors of intensity, speed, and time in performance, which seeks to develop the speed of skill performance, which is one of the reasons for overcoming the opponents' defenses in individual confrontations or penetrating the ranks of the opponents' collective defenses.

It does not give enough time to adopt defensive skills or defensive movements by competitors, (Ahmed Abdel-Aimah: 2021: 236-249) and that the exercises were prepared and were characterized by continuity, specificity, and the use of a simultaneous method, which had an impact in developing the speed of skill performance, and this is what is supported by (Youssef Lazem Kamash: 1999) states, "The basic skills are composed of several factors that the player uses in the match, such as individual skills, team play, and knowledge of the rules of the game. Therefore, football requires that the player perform the basic skills."

With the utmost speed, accuracy, and a high possibility and ability to change his direction with the ball (Othman Mahjoub Khalaf: 2021: 347-357) "As Hossam Muhammad Jaber explains, performing in futsal football requires a great deal of speed of motor and skill performance for the purpose of keeping up with modern game plans and their methods that have developed." Significantly recently (Hossam Mojamed Jaber: 2023: 188-199)

The researcher believes that each event and game has characteristics, advantages, and requirements, especially in the energy system used, and one of the reasons for improving the level is the coach's ability to analyze the types of energy systems by developing the three systems that are used in the futsal match, as Mufti Ibrahim mentions.

"The closer the training conditions are to the conditions of the competition (the match), the more beneficial the training will be to the player and achieve the goals of reaching the level of match performance" (Mufti Ibrahim Hammadi: 1998: 200), as it gains the individual the ability to flow movement, compatibility, the ability to relax, and the sound sense of performing directions and distances. All of them are necessary factors for athletic performance, regardless of the type of activity the athlete engages in

The researcher attributes the development that occurred in the futsal skill performance speed test for the experimental group to the regularity and good enthusiasm in applying the exercise vocabulary, as regularity and proper use of the training time

It leads to raising the level and achieving the goals of each training unit during performance, especially if the exercise is characterized by a progression from easy to difficult and from simple to complex, and this is what both (Hamdi and Yasser Abdel Azim: 1997) indicate: "The organized practice of training is the goal of developing the athlete's thinking on how to Gradual progression to reach the goal, because good organization is one of the foundations for achieving goals" (Hamdi Ahmed and Yasser Abdel Kazem: 1997: 78)

CONCLUSIONS

1- The complex skill exercises had a positive role in developing the speed of skill performance, and this is what was indicated by the significant differences between the pre- and post-tests of the experimental group.

2- Also, the changes that occurred in the experimental research sample in biochemical and functional variables had the greatest impact on improving their metabolic flexibility compared to the control group.

REFERENCES

1. Othman Mahjoub Khalaf (2021). The effect of the proposed method of controlling degrees of training load in developing the speed of complex offensive skill performance of young football players. Journal of Physical Education Studies and Research, 30(4), 347–357. Retrieved at from https://jsrse.edu.iq/index.php/home/article/view/157
2. Razzaq Zaghir, & Jassim Muslim A. (2023). The relationship between performance endurance and some functional and chemical indicators and attention span among competitive and non-competitive wrestlers. Journal of Physical Education Studies and Research, 33(2), 142–155. https://doi.org/10.55998/jsrse.v33i2 .432
3. Donia Najat Rasheed (2021). Designing and codifying two tests for the speed of complex skill performance among young female basketball players. Journal of Physical Education Studies and Research, 31(4), 342–356. Retrieved at from https://jsrse.edu.iq/index.php/home/article/view/36 -
4. Abdul Imam Kazem (2021). The effect of training complexity by reducing rest according to the regulation of intensity (adding (1) second for every (5%) that reduces the percentage) to develop the speed of offensive skill performance of young basketball players. Journal of Physical Education Studies and Research, 29(4), 236–249. Retrieved at from https://jsrse.edu.iq/index.php/home/article/view/226
5. Abdul Ali Jaafar and Hossam Muhammad Jaber. (2023). The effect of competitive skill training in limited spaces to develop speed and endurance of skill performance in futsal. Journal of Physical Education Studies and Research, 33(1), 188–199. https://doi.org/10.55998/jsrse.v33i1 .415

6. Maitham Jabbar Matar; The effect of different forms of similar training loads on developing some special physical abilities and skills in football, unpublished master's thesis, University of Basra, 2010,
7. Muhammad Abdullah Sayhoud: Studying the genetic properties of the leptin gene and preparing a nutritional physical curriculum and its effect on the mass index and some indicators.
8. Hashim Adman Al-Kilani, The Guide to Fitness, Amman, Al-Rafidi Press, 1992.
9. Muhammad Hassan and Abu Al-Ela Ahmed: Physiology of sports training. Cairo . Dar Al-Fikr Al-Arabi. 2000. p. 161.
10. Qasim Hassan Hussein: Foundations of Sports Training, Baghdad, 1st edition, 1998, p. 117 0
11. Resan Khouribet Majeed: Applications in physiology and sports training. Oman . Dar Al-Shorouk. 1997.
12. Muhammad Hassan and Abu Al-Ala Ahmed Abdel Fattah (1996): a previously mentioned source. p. 13.
13. Abdullah Hussein Al-Lami, Scientific Foundations of Sports Training, Al-Qadisiyah University, Al-Tif Printing, 2004.
14. Muwafaq Majeed Al-Mawla and Kazem Al-Rubaie; Physical preparation for football, University of Baghdad, House of Wisdom, 1980, pp. 20-27.
15. Raysan Khuraibet, Abu Al-Ala Abdel Fattah: Sports Training, 1st edition, Al-Kitab Publishing Center, Cairo 2016
16. Ezzat Mahmoud Kashif; Psychological preparation for athletes, (B, I), Dar Al-Fikr Al-Arabi for Printing and Publishing, 1991,
17. Youssef Lazem Kamash: Physical Fitness for Football Players, Libya, Al-Nasser University, 2002,
18. Youssef Lazem Kamash, Basic Skills in Football, Education - Training, Amman, Gulf Printing House, 1999,
19. Mufti Ibrahim Hammad: Modern sports training, planning, application and leadership: Cairo, Dar Al-Fikr Al-Arabi, 1998,
20. Essam Abdel Khaleq: Sports Training Theories - Applications, 9th edition, Alexandria, Dar Al-Fikr Al-Arabi, 1999,
21. Hamdi Ahmed and Yasser Abdel Azim: Sports training, its ideas and theories, Zagazig University, 1997, Mensink,R.P. and Katan,M.B. (1992) Effect of dietary fatty acids on serum lipids and lipoproteins: Ameta – analysis of 27 trials. (Arterioscler. Thombo. 12:915.