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THE EFFECT OF COMPLEX EXERCISES ON DEVELOPING VO2MAX EFFICIENCY FOR KARBALA YOUTH FOOTBALL CLUB PLAYERS

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ABSTRACT

Training methods are crucial in preparing athletes to enhance their physical, functional, technical, and tactical abilities. The integration of concepts from other training sciences has supported the development of these preparations. Among these sciences is exercise physiology, which plays a role in regulating training loads in light of functional processes, internal systems, and metabolic processes involved in energy production, both aerobic and anaerobic. Aerobic and anaerobic capacities are fundamental to the formation and development of the functional and physical abilities of football players. These capacities can be trained through specific, standardized exercises, which some coaches employ when implementing their training programs. However, they often focus on a single aspect of functional capacity development, combining aerobic or anaerobic exercises within a training session. This approach requires significant effort to implement, and it fails to accurately reflect the player's conditions during competitions or football matches. Therefore, this research aims to address this issue by incorporating aerobic and anaerobic capacity exercises into a single training session. This approach is designed to be time- and effort-efficient, accurately representing the competitive conditions of football players. The research Objectives are To identify the effect of a proposed aerobic and anaerobic exercise approach on developing the functional and physical abilities of 13-14 year old football players. And To determine the effect of aerobic and anaerobic exercises on developing the functional and physical abilities of 13-14 year old football players. Also the research hypotheses there are statistically significant differences in the effectiveness of aerobic and anaerobic exercises in developing physical abilities between the experimental and control groups, favoring the experimental group. And There are statistically significant differences in the effectiveness of aerobic and anaerobic exercises in developing functional abilities between the experimental and control groups, favoring the experimental group.

KEYWORDS: *Complex exercises, Vo2max, Youth, Football.*

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INTRODUCTION

Training methods are crucial in preparing athletes to enhance their physical, functional, technical, and tactical abilities. The integration of other scientific concepts into training has supported the development of these preparations. Among these sciences is exercise physiology, which plays a role in regulating training load in light of functional processes, internal systems, and metabolic processes involved in energy production, both aerobic and anaerobic. These include aerobic and anaerobic training methods, which are considered general training approaches. Each training method is standardized based on the specific characteristics of the activity. This is evident in the varying ratios of aerobic and anaerobic capacities across all sports, particularly in football, a widely popular sport with long competition periods. This necessitates a training strategy to guide the team to tangible achievements that reflect consistent performance resulting from long-term scientific planning. This planning includes standardized training programs aligned with developmental stages to achieve the team's objectives. Therefore, it requires well-designed, scientifically sound training programs aimed at developing physical, functional, technical, and tactical attributes in accordance with the nature of the exertion required in a 90-minute match.[1]

Sustaining such a long period of performance requires the development of certain physical attributes, most importantly aerobic endurance. We observe that aerobic and anaerobic capacities receive significant attention in training through specific aerobic and anaerobic exercises designed to enhance the physical and functional abilities of football players. This enables them to fulfill the requirements of the game from both a legal and technical perspective. Players must maintain physical exertion interspersed with sudden movements, demanding both aerobic and anaerobic capabilities. Hence, the importance of research into the impact of aerobic and anaerobic exercises on the development of certain functional and physical abilities.

RESEARCH PROBLEM

Aerobic and anaerobic capacities are fundamental to the formation and development of the functional and physical abilities of football players. These capacities can be trained through specific, standardized exercises, which some coaches employ when implementing their training programs. However, they often focus on a single aspect of functional capacity development through either aerobic or anaerobic exercises within a training session. This approach requires significant effort in implementing these training units. Furthermore, this fragmentation of the training program fails to accurately reflect the player's conditions or state during competitions or football matches. Therefore, the researcher decided to study this problem by incorporating proposed exercises for both aerobic and anaerobic capacities within a single training session. These exercises are implemented in a way that is economical in terms of effort and time during the training process, thus accurately representing the competitive conditions of a football player.

RESEARCH OBJECTIVES

1. To identify the effect of some proposed exercises using an integrated aerobic and anaerobic approach on developing the functional and physical abilities of football players aged (13-14) years.
2. To determine the effect of aerobic and anaerobic exercises on developing the functional and physical abilities of football players aged (13-14) years.

RESEARCH HYPOTHESES

1. There are statistically significant differences in the effectiveness of aerobic and anaerobic exercises in developing physical abilities between the experimental and control groups, favoring the experimental group.
2. There are statistically significant differences in the effectiveness of aerobic and anaerobic exercises in developing functional abilities between the experimental and control groups, favoring the experimental group.

RESEARCH SCOPE

- Human Scope: A sample of football players aged (13-14) years.
- Time Scope: From November 11, 2025, to January 11, 2026.
- Spatial Scope: Karbala Club Stadium.

RESEARCH METHODOLOGY

The experimental method was used as it is suitable for addressing this problem.

1. RESEARCH SAMPLE

The research population consisted of (45) football players aged (13-14) years from the Karbala Club. (24) players, representing (53%) of the original population, were selected purposively, excluding goalkeepers. The sample was homogenized using the variables of height and weight, as shown in Table (1). The age variable was also homogeneous, as the sample was selected from a single age group. The sample was randomly divided into two equal groups by lottery. The experimental group consisted of (12) players who underwent aerobic and anaerobic exercises, while the control group, also consisting of (12) players, followed the program prepared by the club.

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Table 1. shows the homogeneity of the sample for the variables of height and weight

variable	Mean	Std	Median	Skewness
Height	1.56	0.1	1.54	±0.6
Weight	54.21	9.48	52	±0.699

Table (1) shows that the mean for the height variable was (1.56), the standard deviation was (0.1), and the median was (1.54), while the skewness coefficient was (+0.6). For the weight variable, the mean was (54.21), the standard deviation was (9.48), the median was (52), and the skewness coefficient was (+0.699). It is known that the acceptable skewness coefficient is between (+3). Since the values of the sample variables were within the required range, the sample was homogeneous.

2. INSTRUMENTS USED IN THE RESEARCH

1. Electronic pulse oximeter (3200 EC) (Japanese origin).
2. Spirometer (vital capacity device) (German origin).
3. Anaerobic power meter (Diyala, Iraqi origin).
4. Two electronic watches (060-om3) (Diamond).
5. A wooden box, 51 cm high (locally made).
6. A metric ruler.
7. Forty (40) stakes.
8. Twelve (12) footballs.
9. A medical scale with a ruler for measuring height and weight, Peas Personae brand (Italian made).
10. A 50 m long metal measuring tape, Eston brand (Japanese made).

3. TESTS USED IN RESEARCH

After reviewing the most important scientific sources specializing in physical education testing and measurement, and consulting experts and specialists, the researcher developed questionnaires to assess the most important physical and functional abilities. Tests that received 70% approval from the experts and specialists were selected, as shown in Table 2.

Table 2. Shows the percentages of specialists and experts who selected the most important functional and physical abilities

Ability	The element	Component	Percentages	Acceptable ratio	Unacceptable percentage
Physical abilities	Muscular strength	Maximum force	50%		×
		Velocity-characterized force	62.5%		×
		Explosive force	87.5%	✔	
		Strength endurance	62.5%		×
	speed	Maximum translational velocity	75%	✔	
		Kinetic speed	75%	✔	
		Reaction with change of direction	62.5%		×
	Endurance	General endurance	100%	✔	
		Speed endurance	87.5%	✔	
	flexibility		87.5%		
Functional capabilities	Power systems	Long anaerobic capacity	100%	✔	
		Short anaerobic capacity	50%		×
		Aoxic capacity	100%	✔	
	Functional function of the circulatory system	Pulse measurement	50%		×
		Blood pressure measurement	50%		×
	Functional function of the respiratory system	Vital capacity	83.3%	✔	
		Pulmonary ventilation	0 %		×
		Expiratory velocity	0 %		×
		Inspiratory velocity	% 0		×

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4. PILOT STUDY

The researcher conducted a pilot study on November 12th and 13th, 2025, with a sample of (6) players aged (13-14) years. They underwent tests and some suggested exercises and were subsequently excluded from the main study. The purpose of the pilot study was to identify the following:[2]

1. To determine the most significant obstacles the researcher faced while conducting the tests and implementing the training program.
2. To assess the suitability and suitability of the equipment and tools used in the research.
3. To determine the time spent by the research sample in completing the tests.
4. To assess the coordination and organization of the support team involved in conducting the tests.
5. To identify and address any difficulties, problems, or errors that the researcher might encounter during the actual research study.

5. PRE-TESTS

The researcher conducted the pre-tests on November 15th and 16th, 2025, at the Karbala Stadium during two training sessions. The first session included tests for measuring the height and weight of the research sample, conducting a flexibility test, a 30-meter sprint, ball rolling, kicking the ball as far as possible, and the Cooper test. In the second training session, the remaining tests were completed in the air-conditioned lecture hall of the training center, where the temperature was controlled (measuring pulse, measuring vital capacity, the football reaction time test, the anaerobic capacity test, and the anaerobic capacity test (Harvard test)).

6. PROPOSED AEROBIC AND ANAEROBIC EXERCISES

After conducting the pre-tests and consulting with experts and specialists regarding the aerobic and anaerobic exercises prepared by the researcher, these exercises were implemented in the training session with the experimental group on November 18th, 2026. This included two training sessions during the week, out of a total of three training sessions on Saturdays. On Mondays and Wednesdays, between 3:00 PM and 5:00 PM, the training center, in coordination with the team coach, allocated 30-45 minutes of the total 120-minute training session for the proposed aerobic and anaerobic exercises. The exercises were implemented over a period of eight weeks, with two training sessions per week. The researcher determined the intensity and volume of these exercises based on time and heart rate, in consultation with experts and specialists.

7. POST-TESTS

After completing the aerobic and anaerobic exercises prepared by the researcher on January 9, 2026, the researcher conducted post-tests on January 9 and 10, 2026. The researcher considered the similar conditions under which the physical and functional tests were conducted, following the same order and procedures as the pre-tests.

8. STATISTICAL METHODS

The researcher used the SPSS statistical package.

RESULTS AND DISCUSSIONS

PRESENTATION, ANALYSIS, AND DISCUSSION OF SAMPLE CHARACTERIZATION RESULTS:

Table 3. shows the arithmetic means, standard deviations, and calculated t-value for the sample characteristics between the control and experimental groups

Variables	Experimental group		Control group		(t) value	(t) tabulated	df	Level of significance	Result
	Mean	Std	Mean	Std					
Height (m)	1.55	0.06	1.54	0.07	0.35	2.074	22	0.05	Non sig.
Weight (kg)	54.5	9.31	53.8	10,05	0.177				Non sig.

* Under 22 degrees of freedom and a significance level of 0.05.

Table 4 shows that the mean was 1.55 and the standard deviation was 0.06 for the experimental group. For the control group, the mean was 1.54 and the standard deviation was 0.07. The calculated t-value (0.35) indicates no statistically significant difference, as the tabulated t-value was higher than the calculated t-value. This applies to the sample's height variable. For weight, the mean was 54.5 and the standard deviation was 9.301 for the experimental group. For the control group, the mean was 53.8 and the standard deviation was 10.05. The calculated t-value (0.177) indicates a random difference, as the tabulated t-value was higher than the calculated t-value.

The researcher attributes the lack of significant differences between the experimental and control groups in height and weight to the sample's equivalence, given that the sample was pre-selected by the training center's technical staff to form the team from the same age group. This facilitated the researcher's task of ensuring sample equivalence.3

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PRESENTATION, ANALYSIS, AND DISCUSSION OF FUNCTIONAL ABILITIES RESULTS

Table 4. shows the arithmetic means, standard deviations, and calculated t-value for functional abilities between the experimental and control groups in the pre-tests

Test	Experimental group		Control group		(t) value	(t) tabulated	df	Level of significance	Result
	Mean	Std	Mean	Std					
Vital capacity (mmHg)	4.03	0.46	4,30	0.402	1.54	2.074	22	0.05	Non sig.
Anoxic capacity (kg.cm/s)	24.48	1.67	25.2	1.3	1.18				Non sig.
Harvard anoxic capacity (kg.cm/s)	35.13	1.28	34.6	1.14	1.071				Non sig.

Table (4) shows that the experimental group had a mean of (4.03) and a deviation of (0.46) in the vital capacity test, while the control group had a mean of (4.30) and a deviation of (0.402). The calculated t-value (1.54) indicates that the difference is random. In the anaerobic capacity test, the experimental group had a mean of (24.48) and a deviation of (1.67), while the control group had a mean of (25.2) and a deviation of (1.3). The calculated t-value (1.18) is less than the tabulated value, indicating that the difference is random. Finally, in the anaerobic capacity test (Harvard test), the experimental group had a mean of (35.13) and a deviation of (1.28), while the control group had a mean of (34.6) and a deviation of (1.14). The calculated t-value (1.18) indicates that the difference is random. (1,071) This indicates that the random difference is greater than the calculated value of the tabulated t-value.

Table 5. shows the arithmetic means, standard deviations, and calculated t-value for functional abilities between the experimental and control groups in the post-tests

Test	Experimental group		Control group		(t) value	(t) tabulated	df	Level of significance	Result
	Mean	Std	Mean	Std					
Vital capacity (mmHg)	4.55	0.35	4.47	0.34	0.56	2.074	22	0.05	Non sig.
Anoxic capacity (kg.cm/s)	26.96	1.24	25.8	1.16	2.367				Sig.
Anoxic capacity (kg.cm/s)	39.55	2.55	35.21	1,06	5.45				Sig.

*Under 22 degrees of freedom and a significance level of 0.05.

Table 5 shows that the mean and skewness of the experimental group in the vital capacity test were 4.55 and 0.35, while the mean and skewness of the control group were 4.47 and 0.34. The calculated t-value was 0.56, indicating a random difference because the tabulated t-value was higher than the calculated t-value.

In the anaerobic capacity test, the mean and skewness of the experimental group were 26.96 and 1.24, while the mean and skewness of the control group were 25.8 and 1.16. The calculated t-value was 2.367, indicating a significant difference because the calculated t-value was higher than the tabulated t-value.

In the oxygen saturation test, the experimental group had a mean of 39.55 and a deviation of 2.55, while the control group had a mean of 35.21 and a deviation of 1.06, with a calculated t-value of 5.45. The difference was statistically significant because the calculated t-value was higher than the critical value.

The researcher attributes the lack of significant differences in the results shown in Table (5) between the control and experimental groups in the pre-tests to the equivalence of the sample in functional abilities. However, the results, as shown in Table (5), revealed significant differences between the pre-test and post-test for both the experimental and control groups in all functional abilities. This allowed the work to be scientifically sound and based on individual and physiological capabilities that achieve functional adaptation to improve the player's physical and health level and to meet the requirements of physiological preparation for football players. Preparation should be directed towards training functional abilities, "when training functional abilities, the direction of training must be determined quantitatively, qualitatively, and methodically according to the basic system of energy extension."3 Furthermore, because football requires changing situations during matches, it has the characteristic of diversifying the body's energy systems between the aerobic and anaerobic systems. The "energy metabolism depends on the ball The foot is on the continuous diversification of its production systems, which are a mixture of oxygenic and anaerobic energy 4. The energy used by football players is a mixture of oxygenic and anaerobic energy in a ratio of (60%) anaerobic energy and (40%) oxygenic energy 5. To confirm the importance of functional abilities in football players, the research results showed the development rates of both the experimental and control groups in functional abilities represented by the research variables (vital capacity, anaerobic abilities, and anaerobic abilities), as shown in Figure (1) and indicated respectively as (12.9%, 3.95%), (10.13%, 2.38%), and (12.58%, 1.76%). To determine the best results between the control and experimental groups in functional abilities, as shown in Table (7), the researcher identified these differences by comparing the tests. The post-test

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results for both groups showed that the experimental group performed better in developing functional capacities in both aerobic and anaerobic capacities.

The researcher attributes this to the tailoring of exercises designed according to anaerobic and aerobic energy systems, which was appropriate to the functional state of the experimental group and helped develop these functional capacities. Mohammed Hassan Alawi and Abu Alaa Ahmed (2000) indicate that the success of the training program lies in tailoring the training load to the body's physiological state. 6Meanwhile, the results for the vital capacity variable showed no differences between the two groups, as they underwent training aimed at developing aerobic capacity, which in turn influenced the development of vital capacity. Regular exercise training, especially aerobic training that relies on oxygen use, leads to changes in the efficiency of respiratory processes, thus increasing vital capacity.

PRESENTATION, ANALYSIS, AND DISCUSSION OF PHYSICAL ABILITIES RESULTS

Table 6. Shows the arithmetic means, standard deviations, and calculated t-value for physical abilities between the experimental and control groups in the pre-tests

Test	Experimental group		Control group		(t) value	(t) tabulated	df	Level of significance	Result
	Mean	Std	Mean	Std					
Flexibility (Forward Trunk Flexion) (degrees)	3	2.56	2.3	1.56	0.81	2.074	22	0.05	Non sig.
30m Sprint (seconds)	5.22	0.36	5.087	0.317	0.987				Non sig.
Foot Rebound Time Test (seconds)	4.01	0.196	4.04	0.182	0.389				Non sig.
Ball Roll (seconds)	41.57	2.92	40.33	2.19	1.158				Non sig.
Farthest Kick (meters)	32.82	4.85	34.875	4.25	1.18				Non sig.
Cooper Test (meters)	2479.8	232.49	2466.25	353.36	0.11				Non sig.

*Under 22 degrees of freedom and a significance level of 0.05.

Table 6 shows that the experimental group had a mean of 3 and a skewness of 2.56 in the trunk flexion test, while the control group had a mean of 2.3 and a skewness of 1.56. The calculated t-value of 0.81 was less than the critical value, indicating that the difference was random.

In the 30-meter sprint test, the experimental group had a mean of 5.22 and a skewness of 0.36, while the control group had a mean of 5.087 and a skewness of 0.317. The calculated t-value of 0.987 was less than the critical value, indicating that the difference was random.

In the foot reaction time test, the mean was 4.01 and the standard deviation was 0.196 for the experimental group, while the mean was 4.04 and the standard deviation was 0.182 for the control group. The calculated t-value was 0.389, which is less than the tabulated value, indicating that the difference is random.

In the ball rolling test, the mean was 41.57 and the standard deviation was 2.92 for the experimental group, while the mean was 40.33 and the standard deviation was 2.19 for the control group. The calculated t-value was 1.158, which is less than the tabulated value, indicating that the difference is random. In the ball-kicking ability test, the mean was 32.82 and the standard deviation was 4.85 for the experimental group, while the mean was 34.875 and the standard deviation was 4.25 for the control group. The calculated t-value was 1.18, which is less than the critical value, indicating that the difference is random.

In the Cooper test, the experimental group had a mean of 2479.8 and a standard deviation of 232.49, while the control group had a mean of 2466.25 and a standard deviation of 353.36. The calculated t-value was 0.11, which is less than the critical value, indicating that the difference is random.

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Table 7. shows the means, standard deviations, and calculated t-values for physical abilities between the pre-test and post-test for the experimental and control groups

Variables	Groups	Pre-test		Post-test		Mean diff.	Std diff	(t) value	(t) tabulated	Rate of development	Result
		Mean	Std	Mean	Std						
Trunk Flexion	Exp.	3	2.56	6.17	1.95	2.92	0.36	8.11	2.201	51.36%	Sig.
	Cont.	2.3	1.56	3.58	1.44	1.25	0.22	5.68		35.75%	Sig.
30 m Sprint (seconds)	Exp.	5.22	0.36	4.83	0.22	0.39	0.061	6.39		7.47%	Sig.
	Cont.	5.087	0.317	4.82	0.24	0.248	0.048	5.17		5.25%	Sig.
Foot Return Time (seconds)	Exp.	4.01	0.196	3.32	0.29	0.69	0.06	11.5		17.2%	Sig.
	Cont.	4.04	0.182	3.93	0.098	0.19	0.07	2.71		2.72%	Sig.
Ball Roll (seconds)	Exp.	41.57	2.92	37.08	2.05	4.47	0.41	10.9		10.8%	Sig.
	Cont.	40.33	2.19	39.43	2.09	0.9	0.08	11.25		2.23%	Sig.
Kick Ball as far as possible (m)	Exp.	32.82	4.85	42.31	4.18	9.49	0.57	16.65		28.92%	Sig.
	Cont.	34.175	4.25	40.73	4.54	5.85	0.72	8.36		16.79%	Sig.
Cooper Test (m)	Exp.	2479.8	232.49	2874.58	135.23	397.75	63.75	6.19		15.92%	Sig.
	Cont.	2466.25	353.76	2666.66	239.63	192.08	36.6	5.25		8.13%	Sig.

*Under 11 degrees of freedom and a significance level of 0.05.

Table 7 shows that the flexibility test (trunk flexion forward) for the experimental group was significantly different between the pre-test and post-test. The mean difference was 2.92, the slant deviation was 0.36, and the calculated t-value was 8.11, which is higher than the critical value, indicating that the differences were significant. For the control group, the mean difference was 1.25, the slant deviation was 0.22, and the calculated t-value was 5.68, which is higher than the critical value, indicating that the differences were also significant.

In the 30-meter sprint, the pre- and post-tests for the experimental group showed a mean difference of 0.39 and a skewness of 0.061. The calculated t-value was 6.39, which is higher than the critical t-value, indicating that the differences were statistically significant. For the control group, the mean difference was 0.248 and the skewness of 0.048. The calculated t-value was 5.17, which is higher than the critical t-value, indicating that the difference was statistically significant.

In the selection of foot return time, the pre- and post-tests for the experimental group showed a mean difference of 0.69 and a skewness of 0.06. The calculated t-value was 11.5, which is higher than the critical value, indicating that the differences were statistically significant. For the control group, the mean difference was 0.19 and a skewness of 0.07. The calculated t-value was 2.17, which is higher than the critical t-value, indicating that the difference was statistically significant.

In the ball-rolling test, the pre- and post-tests for the experimental group showed a mean difference of 4.47 and a skewness of 0.41. The calculated t-value was 10.9, which is higher than the critical value, indicating that the differences were statistically significant. For the control group, the mean difference was 0.9 and the skewness of 0.08. The calculated t-value was 11.25, which is also higher than the critical value, indicating that the difference was statistically significant.

In the test of kicking the ball as far as possible, the pre- and post-tests for the experimental group showed a mean difference of 9.49 and a skewness of 0.57. The calculated t-value was 16.65, which is higher than the critical value, indicating that the differences were statistically significant. For the control group, the mean difference was 5.85 and the skewness of 0.72. The calculated t-value was 8.36, which is also higher than the critical value, indicating that the difference was statistically significant.

As for the (Cooper test), the pre- and post-tests of the experimental group show that the mean difference is (394.75) and its deviation is (63.75), and by extracting the calculated (t) value of (6.19), which is higher than the tabulated value, which indicates that the differences are significant. As for the control group, the mean difference was (192.08) and its deviation was (36.6), and by extracting the calculated (t) value of (5.25), which is higher than the tabulated value, which indicates that the difference is significant.

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Table 8. shows the arithmetic means, standard deviations, and calculated (t) value for physical abilities between the experimental and control groups in the post-tests

Variables	Exp. Group		Cont. group		(t) value	(t) tabulated	df	Level of significance	Result
	Mean	Std	Mean	Std					
Flexibility (forward trunk flexion)	6.17	1.95	3.58	1.44	3.73	2.074	22	0.05	Sig.
30-meter sprint (seconds)	4.83	0.22	4.82	0.24	0.11				Non sig.
Foot reaction time test (seconds)	3.32	0.29	3.93	0.098	6.79				Sig.
Ball roll (seconds)	37.08	2.05	39.43	2.09	2.78				Sig.
Kick ball (meters)	42.31	4.18	40.73	4.54	0.89				Non sig.
Cooper test (meters)	2874.58	135.2	2666.66	239.6	2.617				Sig.

*Under 22 degrees of freedom and a significance level of 0.05.

Table 8 shows that the mean score for the trunk flexion test (forward bending) for the experimental group was 6.17 and the skewness of the test was 1.95, while the mean score for the control group was 3.58, the skewness of the test was 1.44, and the calculated t-value was 3.73. The difference was significant because the calculated t-value was higher than the critical value.

In the 30-meter sprint test, the mean score for the experimental group was 4.83 and the skewness of the test was 0.22, while the mean score for the control group was 4.82, the skewness of the test was 0.24, and the calculated t-value was 0.11. The difference was random because the calculated t-value was lower than the critical value.[7]

In the foot rebound time test, the experimental group had a mean of 3.32 and a skewness of 0.29, while the control group had a mean of 3.93, a skewness of 0.098, and a calculated t-value of 6.79. The difference was statistically significant because the calculated value was higher than the tabulated value.

In the ball rolling test, the experimental group had a mean of 37.8 and a skewness of 2.05, while the control group had a mean of 39.43, a skewness of 2.09, and a calculated t-value of 2.78. The difference was statistically significant because the calculated value was higher than the tabulated value.

In the "Kick the Ball as Far as Possible" test, the experimental group had a mean of 42.31 and a skewness of 4.18, while the control group had a mean of 40.73, a skewness of 4.54, and a calculated t-value of 0.89. The difference was considered random because the calculated t-value was higher than the critical value.

In the "Cooper's Choice" test, the experimental group had a mean of 2874.58 and a skewness of 135.23, while the control group had a mean of 2666.66, a skewness of 239.63, and a calculated t-value of 2.617. The difference was considered significant because the calculated t-value was higher than the critical value.

The difference was also significant because the calculated t-value was higher than the critical value.

For the experimental group, the mean was 2874.58 and the skewness was 135.23. The researcher attributes the lack of significant differences in the pre-test results shown in Table (8) between the control and experimental groups to the equivalence of the sample in physical abilities. However, the results, as shown in Table (8), revealed significant differences between the pre-test and post-test for both the experimental and control groups in all physical abilities, due to both groups undergoing standardized training programs.[8]

The control group underwent a program prepared by the technical staff at the football age group training center, while the experimental group underwent the same program in some of its components with the introduction of aerobic and anaerobic exercises prepared by the researcher. As a result, the results showed significant results for both groups.[9] The building training programs improves and develops the processes of supplying the body with energy, which has an impact on the physical and skill level of the athlete. To determine the best results between the control and experimental groups and to find the differences between them, the researcher resorted to two methods.[10] The first was to extract the percentage of development achieved in each of the physical variables, the percentage of development of which appeared respectively in the experimental group and then the control group (flexibility test 51.38%, 35.75%) (30m running test 7.47%, 5.25%) (foot recovery time test 17.21%, 2.72%) (ball rolling 10.8%). 2.23%) (Kick the ball as far as possible 28.92%, 16.79%) (Cooper test 15.92%, 8.13%).

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CONCLUSIONS

Through presenting, analyzing, and discussing the results, the researcher concluded the following:

1. Systematic training through standardized exercises based on energy systems contributes to the development of the functional and physical condition of athletes aged 13-14 years.
2. The results show that the application of the aerobic and anaerobic exercises prepared for the research sample, which were standardized according to energy systems, helped improve the functional abilities of football players aged 13-14 years.
3. The duration of the aerobic and anaerobic exercises prepared by the researcher, which is eight weeks with two training sessions per week, is sufficient to demonstrate development in the physical and functional abilities of football players aged 13-14 years.
4. The results obtained in the research sample for both the experimental and control groups contributed to the development of physical and functional abilities, favoring the experimental group due to their adherence to standardized exercises based on energy systems, unlike the control group, which followed scientifically designed programs that focused on dividing the training regimen.

RECOMMENDATIONS

Considering the foregoing conclusions, the researcher recommends a set of recommendations, the most important of which are:

1. The necessity of regulating training loads according to energy systems, given their importance in developing the physiological, physical, and health condition of the player.
2. The use of prepared aerobic and anaerobic exercises within training sessions for football players in the 13-14 age group.
3. Reliance on functional tests that can be used to evaluate the aerobic and anaerobic capacities of players, thus becoming a standard for revealing the true level of players.
4. The necessity of informing coaches about the importance of the interaction between aerobic and anaerobic exercises within their training sessions, given the inherent nature of football performance, which involves both aerobic and anaerobic capabilities.
5. Directing attention to conducting similar future research that reveals the interaction of aerobic and anaerobic exercises in other age groups and the suitability of training durations for them.

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