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The effect of weight training and plyometric on the muscular ability and motor skills of middle and junior football players.

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ABSTRACT

The study aimed to identify the effect of weight training and plyometric training on muscular capacity, where the researcher used the experimental method based on two training curricula, the first is a weight training curriculum and the second is a plyometric training curriculum using a set of tests for muscular capacity and motor skills on a sample of 40 players from the Kherrata Youth Club active in the second region of Algeria Central divided into 20 players trained with weights and 20 with plyometric training.

The two experimental groups were subjected to a pre-test and then implemented the two training curricula, and the implementation of the two curricula took nine weeks to develop muscle capacity and some skills with three training units per week, thus the number of training units for each group (27) units, and then the post-test was conducted.

The data were statistically analyzed using mean, standard deviation, t-test for correlated samples, t-test for uncorrelated samples, percentage, and the law of rate of progression. The researcher concluded that the training curriculum using weight training and plyometric training to develop muscular capacity and some motor skills.

Keywords: Weight training, plyometric training, muscular capacity, motor skills.

Introduction:

Sports training strives to reach the highest levels, a fact clearly evident in countries advanced in the field of sports. Scientific research is conducted to innovate modern methods and techniques for achieving desired athletic goals through the use of a range of training mechanisms that enhance physical fitness. Modern sports training is based on scientific, technological, and methodological foundations, focusing on improving various physical aspects and elements, including muscular strength and motor skills. Muscular strength and motor skills are of particular interest to most coaches due to their close connection to athletic performance, achievement, and the overall development of each athlete. These qualities are

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crucial to the physical fitness of football players and are among the distinguishing characteristics of one player over another, as well as being one of the most important determinants of their future in the world of football. They represent the ability to perform movements sequentially in the shortest possible time, the ability to increase acceleration and react quickly to a player's position, and the ability to turn and change direction rapidly to launch attacks or return to defense. Some scientists define it as the ability to read the flow of the game and intervene at the right time, whether with or without the ball. Everyone agrees on the importance of speed.

The plyometric training method is among the techniques that have made significant strides. In developing both physical and technical aspects, this type of training increases the muscles' explosive performance. The fundamental principle is contraction by shortening or lengthening, and it is most effective when the contraction occurs immediately after the lengthening of the same muscle or muscle group. This increases the muscles' ability to contract at a faster and more explosive rate throughout the range of motion by optimizing the energy reserves of the working muscles during contraction and relaxation.

Many sports scientists indicate that the link between muscular strength and speed is one of the most important requirements for athletic performance at high levels. This physical ability is a key characteristic of elite athletes, as they possess a high degree of strength, speed, and skill in combining them to create powerful and rapid movements, enabling them to achieve their best athletic results. In football training, there are numerous methods for developing muscular strength in athletes. These include the use of equipment and tools such as Swedish benches, wooden boxes, weight training, plyometric training, and others. Plyometric training, in particular, is a specialized method aimed at enhancing explosive power and improving the relationship between maximum strength and explosive power. Consequently, this type of training has rapidly gained prominence, becoming a leading training tool for all levels and ages. It has also become widely accepted as a suitable training method for a broad range of sports activities where strength plays a significant role.

Through his observations of football training practices, the researcher found that weight training and plyometric training have not been given the necessary attention to help players reach the required level. Therefore, this research highlights the importance of experimenting with the use of weight training and plyometric training to determine their impact on developing muscular strength and certain skills in football players. The efforts exerted in the field of sports training, resulting from various studies and research, have led to advancements in football. However, some problems related to the training process persist, requiring scientific solutions. These solutions fall on the shoulders of coaches and football specialists, and necessitate the search for modern, scientifically sound methods and techniques, supported by experimentation, to enhance players' physical and technical performance. Plyometric training, in particular, is designed to directly develop muscular strength and, consequently, skill performance in various activities. This method is unique in that it combines central and eccentric contraction training techniques to develop muscular power. While both methods or systems have been used to develop explosive power and speed-strength, researchers have not

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yet investigated their impact on muscular strength and specific skills in football players, let alone compared them.

It is clear from the above, and within the researcher's knowledge of previous research and studies, that plyometric training has been designed to achieve direct development of muscular power and thus on the level of skill performance in various activities. The researcher believes that the agreement and disagreement of opinions about the method of developing muscular power led to the emergence of the research problem. Therefore, the researcher's thinking turned to the possibility of planning a training program whose components include muscular power training that develops more than one quality at the same time, as this method works to raise the level of muscular power and raise the level of motor skills and achieve the goals of the model training programs in a very short time.

Research Objectives

This research aims to:

Reveal the effect of weight training on muscular strength and certain skills in football players.

Highlight the effect of plyometric training on improving muscular strength and certain skills in football players.

Determine the rates of improvement in muscular strength and skill tests using both methods.

Research Hypotheses:

1.There are statistically significant differences between the pre-test and post-test scores for both experimental groups, favoring the post-test scores in muscular strength and certain skills among intermediate football players.

2.There are no statistically significant differences in the post-test scores between the two experimental groups for muscular strength and certain skills among intermediate football players.

Research Scope

Human Scope: Youth players of the Kherrata Club in the junior and intermediate categories.

Spatial Scope: 8 May 1945 Stadium, Kherrata.

Temporal Scope: From March 10, 2024, to May 7, 2024. Definition of Terms

Muscular Power: This is the ability of muscles to overcome resistance using high speed of movement.[1].

Plyometric training: Training programs that include a stretching and contraction cycle of the working muscle, which causes its flexibility and enables the muscle to benefit from the reflexive mechanical energy resulting from the stretching effect, leading to greater strength and speed in performance [2]..

Basic (Motor) Skills: These are defined as "all the necessary movements performed for a specific purpose within the framework of the Laws of Football, whether these movements are with or without the ball[3].".

Weight training: Developing muscular strength in its various forms using resistance in the form of varying weights and sets performed with specific repetitions[4] ..

Similar Studies and Research

.3Al-Sufi, Anad Jirjis (1999)

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"A Comparative Study of the Effect of Using Plyometric and Weight Training on Long Jump Performance and Some Physical and Anthropometric Qualities"

The study aimed to:

-Identify the effect of using plyometric training on long jump performance and some physical and anthropometric qualities.

-Identify the effect of using weight training on long jump performance and some physical and anthropometric qualities.

-Compare the effect of using plyometric and weight training on long jump performance and some physical and anthropometric qualities.

-The research was conducted on second-year students at the College of Physical Education, University of Mosul, totaling (26) students. They were divided into two equal groups. One group used plyometric training, and the other group used weight training. The program included (20) training units, with two units allocated per week for each section, totaling (30) minutes, delivered during track and field class. The research results showed the following:

-There were statistically significant differences between the pre-tests and post-tests, in favor of the post-tests, resulting from the effect of using weight training on the following variables (long jump performance, ankle joint extension, 30m sprint, knee flexion flexibility, shoulder joint flexibility, leg explosive power)[5]..

Al-Mashhadani, Muhammad Yunus (2000)

"The Effect of Plyometric Training on Anaerobic Power and Some Variables of Muscle Contraction Mechanism".

The study aimed to:

1. Identify the effect of using plyometric exercises on anaerobic power.

2.Identify the effect of using plyometric exercises on adaptations occurring in some variables of the muscle contraction mechanism of certain lower limb muscles.

The study was conducted on a sample of (18) players representing the Nineveh Governorate football team, aged (17-18) years. They were randomly divided into two equal groups: an experimental group and a control group. The plyometric training program was implemented for the players in the first group, consisting of (24) training sessions, three sessions per week (Sunday, Tuesday, and Thursday) from (3-4 PM) for a period of (8) weeks. The duration of each plyometric training session was (30-35) minutes. The researcher used the following statistical methods:

-Arithmetic mean. T-test. Percentage. Rate of improvement. The study results showed that:

-Plyometric exercises had a positive effect on anaerobic power tests (stationary long jump, standing vertical jump, and power index), with statistically significant differences. This confirms the importance of plyometric exercises in developing anaerobic power.

-No statistically significant differences were found in the 45-yard sprint test as a result of using plyometric exercises.

-Plyometric exercises induced positive adaptations in some of the variables of the muscle contraction mechanism under study (latency period, nerve velocity, and response time at maximal contraction[6].

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- Research Methodology and Field Procedures:

The researcher used the experimental method as it was suitable for the nature of the research.

Research Population and Sample:

The research population was intentionally selected from the junior and youth players of CRB Kherrata football team, active in the second regional division, totaling 40 players. The research sample consisted of 40 players from CRB Kherrata, selected using a non-systematic random sampling method. They were divided into two experimental groups of 20 players each. The players were assigned to the groups by lottery. The first group used plyometric training, while the second group used different conventional training methods. Homogeneity of the Research Groups:

"The researcher should create groups that are equivalent with respect to the variables relevant to the research".

To achieve this, the researcher conducted an equivalence test between the two research groups, controlling for the following variables:

1.Chronological age (measured in years). Height (measured in centimeters). Some physical attributes. Some football skills.

To determine the significance of the differences between the aforementioned variables, equivalence was established between the individuals in the two research groups, and Tables 1, 2, and 3 present the results.

Table 1 shows the statistical parameters and t-values for the variables of age, height, and mass.

Calculated value of (t)	**The second experimental group (plyometric)**		**First experimental group (weights)**		**Variables**
	± C	**S**	**± C**	**S**	
0.55	1.44	17.29	1.28	17.57	Age (years)
0.07	5.77	171.93	6.92	172.11	Length (cm)
0.33	6.11	61.16	7.45	61.13	Mass (kg)

The critical t-value at a margin of error ≤ 0.05 and 26 degrees of freedom = 1.706.

Table (1) shows that the differences between the two research groups were not significant in the variables of age, height, and mass, as the calculated t-value was smaller than the critical t-value at the 0.05 level, indicating the equivalence of the two groups[7]..

The tabulated t-value with a margin of error of 0.05 and degrees of freedom of 26 = 1.706

Table (2) shows that the differences between the two research groups were not statistically significant in some physical attribute variables, as the calculated t-value was less than the tabulated t-value at the 0.05 level, indicating the equivalence of the two groups.

Table (3) shows the skill variables for the two research groups**.**

Calculated value of (t)	**The second experimental group (plyometric)**		**Control group**		**Statistical parameters**
	± C	**S**	**± C**	**S**	

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0.51	0.510	7.23	0.719	7.35	Heading the ball to the farthest distance
0.34	0.91	32.98	2.73	33.24	Kicking the ball with the foot the farthest distance
0.16	0.633	13.020	0.696	13.060	Rolling
1.45	0.64	7.38	0.80	7.78	Side throw
0.62	0.52	5.20	0.686	5.35	intercepting the ball from the opponent

The critical t-value at a margin of error ≤ 0.05 and 26 degrees of freedom was 1.706.

Table 3 shows that the differences between the two research groups in some skills were not statistically significant, as the calculated t-value was smaller than the critical t-value at a margin of error of 0.05 and 26 degrees of freedom. This indicates that the difference was not statistically significant and suggests that the two groups were equivalent.

A high degree of coordination was observed in the performance of the legs, trunk, and arms.

The results of the pre- and post-tests for muscular power variables in the weight training group were presented and discussed.

Table 4 shows the results of the pre- and post-tests for muscular power variables in the first group that used weight training.

Calculated value of (t)	**Post-test**		**Pre-test**		Statistical indicators
	± C	**S**	**± C**	**S**	
2.80	4.62	44.22	4.46	39.41	Explosive power of the leg muscles (vertical jump)
5.96	9.39	218.14	5.74	200.65	Explosive power of the leg muscles (long jump)
6.23	0.45	5.65	0.17	4.84	Explosive power of arm muscles
2.95	0.752	7.32	0.586	6.57	The speed-charging power of the abdominal muscles
2.08	0.296	7.425	0.292	7.656	The distinctive strength and speed of the Yemeni man
1.83	0.527	7.492	0.488	7.842	The left-handed man's distinctive speed and power

Significant at a $p < 0.05$ for 13 degrees of freedom, the tabulated t-value is 1.771.

Table 4 reveals the following:

A statistically significant difference exists for all muscular power variables between the pre-test and post-test, favoring the post-test at a $p < 0.05$ and 13 degrees of freedom for the first group that used weight training.

Upon discussing each physical attribute, we observe the following:

A statistically significant difference exists between the pre-test and post-test, demonstrating the effect of using weight training on the results of the leg explosive power test at a $p < 0.05$ and 13 degrees of freedom. This indicates that weight training had a significant impact on leg explosive power, which aligns with Othman's opinion that the jumping level is clearly controlled by the nature of the main components of physical fitness. Furthermore, the

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utilization of physical fitness depends on neuromuscular coordination and the performance technique used[8]

Al-Sufi believes that the significant improvement in vertical jump results during weight training contributes to the development of strength, which in turn enhances the explosive power of that muscle group. This is reflected in the vertical jump test results. Furthermore, the increased leg circumference resulting from weight training also contributes to the development of lower limb strength.

We observe that weight training positively impacted the explosive power test of the leg muscles.

The researcher attributes this improvement to the fact that the selected weight training exercises had a positive effect on developing muscular strength and, consequently, on the level of skill performance. This is also due to the success of the proposed training program and its impact on improving performance levels. Training the leg muscles using weight training leads to greater strength gains than training other muscle groups.

The use of weight training was clearly evident in the 3 kg medicine ball throw test. Toulan notes that strength plays a prominent role in achieving good results in sports, especially with regard to producing force at the right moment and speed, as concentrating force with increasing its speed is one of the distinguishing characteristics of good skill performance[9]..

The researcher believes that the physical exercises used stimulated the necessary muscle fibers, or at least a sufficient number of them, leading to increased strength. This is because when a muscle is subjected to a stimulus, it may be affected entirely or only partially, depending naturally on the intensity of the stimulus. Furthermore, the exercises used were of high quality, targeted, and progressively advanced, leading to the development of explosive power in the arm muscles.

The researcher also considered the studies by Radcliffe (1995, p. 87) using medicine balls and Ismail (1996, p. 65), which focused on explosive power using three methods, including bodyweight. The researcher attributes this to the fact that the strength and speed exercises used in weight training had a significant impact on developing abdominal muscle strength, which in turn reduced the time required to complete the test. Weight training also increased the strength and speed of muscle contraction, as the exercises used increased the number of muscle fibers involved in the performance, which was reflected positively in the test results.

Furthermore, weight training had an effect on the single-leg hopping test over a distance of (30) meters. This demonstrates that weight training significantly influenced the development of the single-leg hopping test results, confirming the importance of weight training in developing speed-strength. This aligns with what Al-Anbaki emphasized, that the athlete in weight training exerts maximum force to overcome the effect of gravity first, and to raise the weights at an upward speed second, to complete the required exercise. Peen believes that strength develops through regular training, especially if this training includes weights appropriate to the athletes' abilities, with a gradual increase in these loads according to the improvement in their abilities. The researcher indicates that the weight training program applied to the research sample had a positive impact, as demonstrated by the results obtained

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in the muscular strength tests. This aligns with the findings of Hassan, Hamada, and Ajami, whose studies confirmed that weight training has a positive effect on developing muscular strength and skill performance. The results of the pre- and post-tests for motor skills variables in the weight training group are presented and discussed.

Table (5) shows the pre- and post-test results in motor skills for the first group that used weight training.

Calculated value of (t)	**Post-test**		**Pre-test**		Statistical indicators
	± C	**S**	**± C**	**S**	
28.3	579.0	16.8	719.0	7.35	Heading the ball to the farthest distance
50.2	88.2	89.35	73.2	24.33	Kicking the ball with the foot the farthest distance
88.3	624.0	090.12	696.0	060.13	Rolling
59.8	44.0	89.9	80.0	78.7	Side throw
05.3	611.0	10.6	686.0	35.5	intercepting the ball from the opponent

Significant at a margin of error ≤ (0.05) for 13 degrees of freedom, the tabulated t-value = 1.771.

From Table (5), we observe the following:

Significant differences exist between the pre-test and post-test in favor of the post-test in all motor skills tests, as the calculated t-values ranged between (2.50 and 8.59), which is greater than the tabulated t-value at a margin of error of (0.05) and 13 degrees of freedom, which is (1.771)

When discussing each skill,

significant differences are observed between the pre-test and post-test results due to the use of weight training on the results of the heading test for the longest distance, in favor of the post-test.

Weight training is considered the most effective program for preparing athletes at all levels due to its importance in developing physical fitness components. It builds muscle strength while maintaining joint flexibility, which helps the athlete move and control their body parts in a balanced way. Therefore, it serves as a fundamental basis for physical, mental, and physiological preparation.

Ismail emphasizes that strength training using weights enhances bone density, strengthens tendons, ligaments, and connective tissues in muscles, and protects them from injury.

The researcher attributes the improvement in heading ability to the role of weight training in all body muscles, especially the trunk and leg muscles, which significantly impact jumping. Furthermore, heading requires the player to have quick movements and appropriate strength depending on the game situation to execute a successful pass or pass that prevents the opponent from controlling the ball or the goalkeeper from reaching it. A strong jump is necessary to gain a higher height than the opponent, and good acceleration is often essential to achieve the necessary speed for jumping. We also observe statistically significant differences between the pre-test and post-test results due to the use of weight training, favoring the post-

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test in the results of the kicking test. Al-Khashab states that weight training is one of the important factors in football training due to its importance in preparing players well.

Rajab states that the player must obtain the maximum possible force when kicking the ball the farthest distance, which confirms the need for strong leg muscles to perform the contraction and extension process to achieve the greatest possible distance. The researcher attributes this improvement to the effectiveness of the training program and its exercises designed to develop explosive leg muscle power. The positive impact of these exercises was demonstrated by the researcher's findings. The stronger the leg muscles, the greater the football player's control over leg movements. Kicking the ball the longest distance requires significant muscular strength to generate maximum power, enabling the player to reach those distances. This necessitates engaging most of the body's muscles as a unified unit, particularly the leg muscles. Weight training helped the players acquire the appropriate and sufficient strength to achieve this.

We also observed statistically significant differences between the pre-test and post-test results, favoring the post-test results in the side throw test. Performing the side throw, whether close or long, requires strength, although the degree of strength varies between the two. Teams often utilize long-range side throws, especially when they have a skilled thrower and tall players adept at heading the ball[10].

The researcher attributes the improvement to the effectiveness of the training program, which had a clear impact on developing the explosive power of the arm muscles, as well as to the exercises selected within the program. The exercises used were highly effective in developing the explosive power of both the arm and leg muscles. Furthermore, the exercises used to develop the muscular strength of the arm muscles showed good results in the 3 kg medicine ball throw test, confirming the improvement in the side throw performance.

Mastering the side throw skill according to a well-thought-out plan allows the team benefiting from it to devise tactical plans to launch an attack or quickly threaten the opponent's goal.

We also note that the use of weight training had a positive impact on the results of the rolling skill test. "Dribbling is a crucial technique for creating playing space in team events. Running with the ball is the art of using the foot to roll it along the ground while under the player's control." Although modern football emphasizes quick passing between players, dribbling remains essential in many situations. Game conditions may not allow a player to pass the ball directly to a teammate, necessitating dribbling to create space for passing or shooting.

The researcher believes this development stems from the fact that weight training enhances strength, which in turn develops explosive power and speed-strength. This is reflected in dribbling, which requires both explosive power and speed-strength. Weight training also develops leg and arm muscles, which significantly impact dribbling performance. Furthermore, coordination, economy, and precision are all factors that contribute to successful dribbling, and these are taken into account in the training program, which has contributed to improved dribbling skills. Significant differences were found between the pre-test and post-test results in the ball-cutting test, resulting from the use of weight training.

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The researcher attributes these differences to the organization of the proposed training program. The training process relies on its organization, which led to an improvement in player performance levels. This improvement stemmed from the program's alignment with the players' abilities and capabilities, as demonstrated by the results of the group using weight training. The program significantly impacted their physical performance, indicating an improvement in physical conditioning, a crucial aspect of modern football. The ultimate goal of training is to elevate individuals to the highest athletic levels. Furthermore, the players' physical development effectively contributed to the improvement in their technical skills. Abdul-Basir believes that weight training is one of the most effective methods for developing the specific abilities required for a given sport[11]..

The researcher believes that the skill of intercepting the ball from an opponent requires the player to be quick in pouncing on it while focusing on avoiding errors during execution. The weight training exercises were specifically designed to develop overall coordination and movement efficiency, which the player benefits from while performing the skill, thus positively impacting their skill level. The exercises used in the weight training program had a clear effect on this development, particularly in increasing leg muscle strength. This was evident in the muscular strength and skill tests. The development and increased strength of the leg muscles enabled the players to perform the interception skill effectively. This skill requires strength, precision, and agility, as well as coordination between the legs, torso, and arms. The weight training provided the players with sufficient strength, precision, and agility due to the program's variety of exercises, the effects of which were clearly visible in all the tests studied.

Al-Ta'i adds in this regard that the importance of agility for a football player lies in their ability to change direction, perform crosses, sprint, and stop suddenly during exercises, as well as changing body positions while controlling the ball, dribbling, shooting with the foot or head, and finally, their ability to pay attention to the flow of the game when receiving the ball and moving towards the goal or performing a specific movement task.

Presentation and discussion of the pre- and post-test results for the muscular strength variables of the plyometric training group.

Table (6) shows the pre- and post-test results for the muscular strength variables of the second group that used plyometric training.

Calculated value of (t)	Post-test		Pre-test		Statistical indicators
	± C	S	± C	S	
3.48	7.37	46.11	3.16	38.66	Explosive power of leg muscles (vertical jump)
10.12	7.34	84.222	2.53	84.201	Explosive power of the leg muscles (long jump)
4.15	0.40	5.45	0.40	4.82	Explosive power of arm muscles
3.79	0.55	7.38	0.72	6.46	The speed-charging power of the abdominal muscles

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3.59	0.388	7.322	0.333	7.813	The right leg's distinctive speed-strength
2.91	0.326	7.421	0.510	7.891	The left leg's characteristic speed-strength

Significant at a margin of error ≤ 0.05 for 13 degrees of freedom, the tabulated t-value = 1.771.

From Table (6), we observe the following:

There are statistically significant differences between the pre-test and post-test in favor of the post-test in all muscular power tests, as the calculated t-values ranged between 2.91 and 10.12, which is greater than the tabulated t-value for 13 degrees of freedom at a margin of error of 0.05, which is 1.771.

When discussing each physical attribute:

There are statistically significant differences between the pre-test and post-test results due to the use of plyometric training in the explosive leg strength tests. This demonstrates that plyometric training had a significant effect on explosive leg strength, indicating an improvement in standing jump and leaping performance.

These results align with our study's findings that plyometric training significantly improves jumping performance. Plyometric training increases the muscles' ability to contract at a faster rate, thereby enhancing motor performance. This is because the muscles are trained to lengthen and shorten, which helps reduce contraction time and increases the explosive power of the leg muscles.

The researcher attributes this improvement to the effectiveness of the proposed training program using plyometric techniques. This confirms the soundness of the training program's planning in achieving its objectives and tasks. This is accomplished through the application of modern principles and information in training theories and methods, and by carefully sequencing, coherently integrating, and progressively adjusting the quantity and quality of training throughout the program to comprehensively prepare the football player.

We also observed differences between the pre-test and post-test results in favor of the post-test in the 3 kg medicine ball throw test. The exercises implemented in the plyometric training program had a significant positive impact on the development of explosive power in the arm muscles. This is due to their role in activating a large number of muscle fibers and enabling rapid, simultaneous contraction in the shortest possible time.

The researcher attributes this development to the organization of the proposed training program. The training process depends on its organization, which led to an improvement in the players' performance levels. This improvement was achieved through the program's alignment with the abilities and capabilities of the research sample, resulting in their positive development. The results of the pre-test and post-test for motor skills variables in the plyometric training program are presented and discussed.

Table (7) shows the results of the pre-test and post-test in motor skills for the second group that used plyometric training.

Calculat	Post-test	Pre-test	Statistical indicators

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ed value of (t)	± C	S	± C	S	
4.83	0.634	8.28	0.510	7.23	Heading the ball to the farthest distance
4.53	1.25	34.86	0.91	32.98	Kicking the ball with the foot the farthest distance
4.08	0.663	12.020	0.633	13.020	Rolling
4.76	0.44	8.38	0.64	7.38	Side throw
4.47	0.83	6.38	0.52	5.20	intercepting the ball from the opponent

Significant at a margin of error ≤ 0.05 for 13 degrees of freedom, the tabulated t-value is 1.771.

From Table 7, we observe the following: There are statistically significant differences between the pre-test and post-test in favor of the post-test in all skill-based tests, as the calculated t-value ranged between 4.08 and 4.83, which is greater than the tabulated t-value of 1.771 for 13 degrees of freedom and a margin of error of 0.05.

Furthermore, the training methodology, which relied primarily on regular repetition, helped improve the specific strength of the working muscles. When a player wants to head the ball a long distance, they need to move a certain distance. However, in competitive matches with a large number of players, this movement is limited and restricted, preventing the generation of maximum power. To overcome this, it is necessary to develop the working muscles to generate the maximum possible power as quickly as possible. This is achieved by strengthening the flexor and extensor muscles of the thigh, the calf muscles, the sartorius, and the core muscles.

We also observed statistically significant differences between the pre-test and post-test results of using plyometric training in the long-distance kick test, favoring the post-test. A player aiming to hit the ball as far as possible requires strength, necessitating a powerful kick to achieve the greatest distance. We also observe statistically significant differences between the pre-test and post-test results of the plyometric training in the rolling test, favoring the post-test.

The researcher believes that the rolling skill requires rapid muscle contractions for optimal performance. A study by Rajab indicated a significant relationship between rolling skill and speed-strength.

The researcher believes that plyometric training improves coordination between the arms and legs. The actions of landing and climbing boxes and ascending stairs require significant arm movement and swinging, leading to synchronized arm and leg action, which in turn affects the rolling skill.

We also observe statistically significant differences between the pre-test and post-test results of the side throw test, favoring the post-test. Plyometric training develops explosive power, speed-strength, and strength endurance. This development positively impacts an individual's ability to achieve better results, especially if the test involves explosive or speed-strength components.

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Furthermore, the training program helps develop the working muscles, which in turn improves coordination between them. In football, the throw-in is a skill involving the leg, torso, and arm muscles, as the force originates in the legs and then transfers to the torso, arms, and finally the ball. Without coordination, the process is incomplete.

We also observed statistically significant differences between the pre-test and post-test results in the interception test, favoring the post-test, as a result of using plyometric training.

In football, agility is crucial, as it is essential for players to control their body position and movement, enabling them to perform skills flawlessly, whether on the ground or in the air.

Al-Khashab et al. emphasize that a good football player possesses a certain degree of agility in executing specific skills.

From the above, it is clear that plyometric training has led to improved performance in the skill of intercepting the ball from an opponent by increasing the flexibility and elasticity of the muscles and joints involved in the performance. Furthermore, players have gained a high degree of flexibility, agility, and accuracy as a result of using various types of plyometric exercises such as jumps, hops, medicine balls, hurdles, and obstacles. These exercises have also contributed to players developing a high degree of coordination between the legs, torso, and arms.

The results of the discussion on the effect of using weight training and plyometric training on muscular strength variables are presented and discussed.

Table (8) shows the post-test results and t-values for muscular strength variables for the weight training and plyometric training groups.

Calculated value of (t)	**Plyometric training**		**Weight training**		Statistical indicators
	± C	S	± C	S	
0.81	7.37	46.11	4.62	44.22	Explosive power of the leg muscles (vertical jump)
1.48	7.34	222.84	9.36	218.14	Explosive power of the leg muscles (long jump)
1.25	0.40	5.45	0.45	5.65	Explosive power of arm muscles
0.23	0.55	7.38	0.75	7.32	The speed-charging power of the abdominal muscles
0.79	0.388	7.322	0.296	7.425	The right leg's distinctive speed-strength
0.43	0.326	7.421	0.527	7.492	The left leg's characteristic speed-strength

Significant at a p-value ≤ 0.05 for 26 degrees of freedom. The tabulated t-value = 1.706.

Table 8 shows non-significant differences between weight training and plyometric training when comparing the results of muscular strength tests. The researcher attributes this to the exercises implemented in both weight training and plyometric training sessions during daily training. The researcher relies on the components of the training load to develop the components of muscular strength. The researcher selected exercises for both methods in a similar manner to ensure a comparable effect on both groups. The selected exercises were structured to suit the players' performance levels, serving both physical and technical

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objectives simultaneously. The exercises were then gradually increased in intensity over time. It is worth noting that scientific planning is fundamental to the advancement of players and the team in football.

The results of the discussion regarding the impact of weight training and plyometric training on motor skill variables are presented and discussed. Table (9) Results of post-tests and the value of (t) for skill tests for the two weight training and plyometric training groups

Calculated value of (t)	**Plyometric training**		**Weight training**		Statistical indicators
	± C	S	± C	S	
0.53	0.634	8.28	0.579	8.16	Heading the ball to the farthest distance
1.23	1.25	34.86	2.88	35.89	Kicking the ball with the foot the farthest distance
0.29	0.663	12.020	0.624	12.090	Rolling
8.98	0.44	8.38	0.44	9.89	Side throw
1.01	0.832	6.38	0.611	6.10	intercepting the ball from the opponent

Significant at a margin of error ≤ 0.05 for 26 degrees of freedom, the tabulated t-value = 1.706.

Table 9 shows no statistically significant differences between weight training and plyometric training when comparing motor skills results, with the exception of the side throw test.

The researcher attributes the lack of significant differences between the skill tests to the exercises implemented in both weight training and plyometric training methods. These methods were based on the principles of training science when planning the training programs. The specificity of the activity was considered to achieve adaptation, while the workload was increased scientifically and logically. All these principles led to the success of both programs and the improvement in the skill level of the research sample. The success of training programs is measured by the progress an athlete makes in their chosen sport, across skill, physical, and functional levels. This depends on the individual's adaptation to the training program.

Conclusions:

-Plyometric training played a positive role in developing muscular power, as demonstrated in tests of (leg explosive power, arm explosive power, abdominal speed-strength, right and left leg speed-strength, and right and left leg speed-strength)

-Plyometric training played a positive role in developing certain motor skills, such as (heading the ball to its furthest distance, kicking the ball to its furthest distance, rolling, side throw, and intercepting the ball)

-Plyometric training led to improved muscular power in tests of (leg explosive power, abdominal speed-strength, and right and left leg speed-strength), and also improved certain skills (heading the ball)

Recommendations and Suggestions:

-Using plyometric and weight training to improve various physical attributes.

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-Employing different plyometric and weight training methods according to the athlete's age and activity level, avoiding reliance on a single training approach.

-Providing specialized plyometric and weight training equipment and tools within teams and clubs.

-Ensuring that coaches and physical trainers at all age levels adhere to a scientific approach when planning training programs.

-Providing access to specialized books on physical fitness and its development.

-Familiarity with plyometric and weight training methods, including all related content and techniques.

References and Footnotes

[1] Ismail, Thamer, Mahmoud, Abadi (1991): Testing and Analysis in Football, Mosul University Press.
[2] Moura, N. A (1988): plyometric Training Introduction to physiological and methodological Basics and Effects of Training International Contribution Brazil, 2 (1), Jon, P. 30-40.
[3] Al-Khashab, Zuhair Qasim, and others (1999): Football, 2nd updated edition, Dar Al-Kutub for Printing and Publishing, University of Mosul
[4] Al-Khashab and others, previous reference, p.
[5] Al-Sufi, Anad Jirjis (1999): "A Comparative Study of the Effect of Using Plyometric and Weight Training on Long Jump Performance and Some Physical and Anthropometric Qualities," Unpublished PhD Dissertation, University of Mosul
[6] Al-Mashhadani, Muhammad Yunus Dhunoun (2000): The effect of using plyometric exercises on anaerobic power and some variables of the muscle contraction mechanism, unpublished master's thesis, College of Physical Education, University of Mosul.
[7] De Bold Vandalen (1982): Research Methods in Education and Psychology, 3rd ed., (translated) by Muhammad Nabil Nawfal, and others, Anglo-Egyptian Library, Cairo.
[8] Othman, Muhammad (1990): "Motor Learning and Sports Training", Dar Al-Ilm Publishing and Distribution, Kuwait.
[9] Toulan, Sadiq (1980): "The effect of developing speed-strength on improving the performance level of some take-off movements in gymnastics," PhD thesis, Faculty of Physical Education for Boys, Alexandria.
[10] Rajab, Walid Khalid (1999): "The relationship between some elements of special physical fitness and the level of performance of some motor skills among football players", Master's thesis, unpublished, College of Physical Education, University of Mosul.
[11] Abdel Basir, Adel (2000): "Biomechanical Analysis of Human Body Movements", First Edition, United Center Press, Port Fouad, Port Said.