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The Effect of Plyometric Training on the Development of Explosive Power, Speed–Strength of the Legs, and Long-Range Shooting Skill in Female Futsal Players

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Abstract: The importance of this study lies in its ability to improve the physical performance of athletes based on their ability to develop muscles' strength through training. In general, the ability to perform any required skill efficiently, accurately, and for prolonged periods without getting tired depends mainly on muscular strength. This may be attained through adopting appropriate techniques of training associated with muscular strength development such as plyometric training. The problem addressed through this study is the low level of explosive power and speed-strength of female futsal players leading to poor performances in physical and technical aspects of game play and hence unfavorable results in terms of winning or losing matches. Additionally, the limitation affects the speed and force with which the player performs some required skills during the game. The purpose of this study was to examine the influence of plyometric training on developing explosive power, leg speed-strength, and long-range shooting skills of female futsal players. The design used in this study was an experimental one owing to the appropriateness of this design to address the research problem. The study involved 12 female participants from the Diyala Directorate of Education futsal team at secondary schools. From the findings obtained, it has been established that there were significant effects resulting from plyometric training in terms of developing certain types of muscular strength and long-range shooting skills among futsal players.

Keywords: Plyometric Training; Explosive Power

Introduction

Research Introduction and Significance

In the current research, the role of plyometric training in the formation of explosive strength, speed-strength ability of the lower limb muscles, and the skills of shooting will be explored among female futsal players to reach the optimum performance level.

Futsal is a sport played worldwide, characterized by fast transitions from attacking to defending and vice versa, as well as the necessity of possessing great abilities of speed and speed-strength for positioning, exploiting weak points in the defense, and technical ball control. Futsal players should have high physical qualities and technical skills in order to prepare successfully for the upcoming matches and perform excellently on the pitch. Moreover, the constant changes taking place in the dynamic environment of the game call for fast transitions both from attack to defense, and vice versa, made by all players from the team. Another important characteristic of futsal includes its tight playing space that requires highly developed physical qualities and technical skills of futsal players in order to cope with the performance of their tactical tasks.

In response to the high physical and technical requirements in futsal, the best nations in the game have introduced highly-developed methodologies into their training process, realizing that physical and technical aspects are among the key pillars of today's game. Motivated by rapid progress in the field of sports science and the desire to reach excellence, there is always a demand for discovering new approaches and introducing the latest training methods. This may help developing countries narrow down the gap that exists between their sport achievements and those of more advanced ones. However, such an issue calls for strategic planning and testing of new methodologies in terms of efficiency and scientific validity.

Sports training methods aim at enhancing the athletic performance and achieving success in various sports events. The difference among existing methodologies and their various effects encourages athletes and scientists to find the best approach in achieving excellent performance.

One of the key physical abilities necessary for the successful performance of the technical skills in futsal includes explosive power and speed-strength, as well as other factors that contribute to athletic performance. Development of the above-mentioned abilities in the lower limbs contributes positively to athletic performance. There exist many ways to develop the abovementioned characteristics, with plyometric training being recognized as one of the best methods.

Research Problem

Improving the performance level requires a high level of physical fitness, especially with respect to muscle strength in its different forms, in order to maintain high-level performance during the whole match period. However, developing such physical capacities cannot be achieved without utilizing appropriate training techniques aimed at enhancing muscle strength.

Based on the researcher's extensive experience in sports training and futsal, whether as a player, trainer, or coach for the Diyala Directorate of Education team, having an international (C-level) coaching certification, the observer realizes a noticeable reduction in shooting efficiency, particularly at the end of each match, which is due to low muscle strength, suggesting the ineffectiveness of training techniques currently adopted for muscle strength development. Accordingly, the researcher suggests adopting a training program that aims at improving muscle strength development, especially through plyometric exercises, which might help overcome the research problem and improve the performance level of the players.

Research Objectives

Investigate the impact of plyometric training on the development of explosive strength, speed-strength, and long-range shooting in female futsal players.

Research Hypotheses

- There are significant differences between the pretest and posttest scores of both experimental and control groups in terms of explosive strength, speed-strength, and long-range shooting among female futsal players.
- There are significant differences between the posttest scores of both experimental and control groups in terms of explosive strength, speed-strength, and long-range shooting among female futsal players, with better results for the experimental group.

Scope of the Study

Human Scope:

Female players of the Diyala Directorate of Education futsal team at the secondary school level for the academic year (2022–2023).

Spatial Scope

The indoor sports and scouting activity hall التابعة (affiliated with) the Diyala Directorate of Education.

Temporal Scope:

The period from (02/02/2023) to (07/04/2023).

Methodology

Research Method

The selection of an appropriate research method consistent with the nature of the research problem and its objectives is a fundamental requirement in scientific research. Accordingly, the researcher adopted the experimental method due to its suitability for addressing the problem under investigation. The study design was based on the equivalent groups approach, comprising an experimental group and a control group.

Research Population and Sample

The process of sample selection is closely linked to the nature of the research from which it is drawn, as it represents the model upon which the researcher conducts the core aspects of the study (2013: 8).

Based on this, the researcher undertook the following procedures to select the study sample:

1. Target Population

   The target population consisted of female futsal players from training centers affiliated with the Directorates of Education across Iraq at the secondary school level for the academic year (2022–2023).

2. Research Population

   The training center of the Diyala Directorate of Education female futsal team at the secondary school level was intentionally selected as the research population for the following reasons:

   - The cooperation of the team and coaching staff.
   - The researcher's prior experience working within the same training centers, facilitating the implementation of the experiment.
   - The availability of appropriate facilities, equipment, and sports resources.

Research Sample

The sample consisted of (12) female players selected from the training center of the Diyala Directorate of Education futsal team for the academic year (2022–2023). The participants were divided into two groups: an experimental group and a control group, each comprising (6) players.

Research Instruments and Data Collection Methods

Research Instruments

The following tools and equipment were used in the study:

- Indoor futsal court
- Ten (10) futsal balls (Chinese-made)
- One (1) whistle (FOX, Canadian-made)
- Five (5) pens
- Twenty (20) plastic markers/cones
- Measuring tape and adhesive tape
- Partitioned goal frame with overlapping square targets

Data Collection Methods:

Data were collected using the following methods:

- Arabic and foreign literature and references
- Testing and measurement procedures
- Data recording sheets
- Statistical methods and tools

- Scientific observation

Tests Used in the Study

Explosive Power Test for the Legs (11:56)

Test Name: Standing Long Jump Test
Purpose: To measure the explosive strength of the leg muscles
Equipment: Flat surface, measuring tape, and a marked starting line
Performance Description:
The subject is made to assume a position at the rear of the starting line with his/her feet spaced about the width of the shoulders apart and with his/her arms in the raised position. The arms are then moved in an upward, downward, and backward direction while the knees are kept partially bent and the trunk angled slightly forward in a manner that resembles a swimmer's starting position. The arms are then vigorously moved forward together with the legs being extended.
Performance Conditions:
Hopping during execution is not permitted.
Scoring Method:
Two trials are allowed for each competitor, with the better one being recorded. The measurement is taken from the inside of the take-off mark to the point where the competitor touches the ground, usually their heels.

Speed–Strength Test for the Legs (2:80)

Test Name: Single-Leg Hopping Test for Maximum Distance in 10 Seconds
Purpose: To measure speed–strength of the legs
Equipment: Stopwatch, whistle, measuring tape, and recording sheet
Performance Description:
The participant stands behind a designated starting mark. Upon hearing the whistle, the participant hops on one leg (of her choice) along a straight, predefined path as quickly as possible.
Scoring Method:
The total distance covered within 10 seconds is recorded. Each participant is given only one attempt.

Shooting Test (14:203)

Test Name: Shooting Accuracy Test Toward a Goal Divided into Overlapping Squares
Purpose: To measure shooting accuracy toward the goal
Equipment:
Five (5) futsal balls and a goal marked with a large rectangle (3 × 2 m) containing four overlapping internal squares as follows:

- First square: 75 × 50 cm
- Second square: 150 × 100 cm
- Third square: 225 × 150 cm

- Fourth square: 3 × 2 m

Performance Description:

There are five balls that are placed in certain places, all of which are located 10 meters away from the area where they are required to be shot. The participant fires these balls one after the other, targeting the target areas according to the level of importance of these targets. The distance between two balls is 50 centimeters.

Performance Conditions:

The test begins with ball number (1) and ends with ball number (5).

Scoring Method:

Scores are assigned based on the zone in which the ball enters:

- 4 points for scoring in zone (4)
- 3 points for scoring in zone (3)
- 2 points for scoring in zone (2)
- 1 point for scoring in zone (1)
- 0 points for shots outside the target

The maximum possible score is 20 points.

If the ball touches the boundary lines between zones, the higher score is awarded.

Pilot Study

The pilot assessment was carried out on February 2, 2023, at 14:00 hrs. It aimed at identifying any limitations associated with the administration of the test and whether the tests were suitable for use in the research sample. The pilot was conducted on a sub-sample of the population consisting of female participants of the Diyala Directorate of Education futsal team in secondary schools. The objectives of the pilot were:

1. Determination of the appropriateness of the tests for the age group being tested.
2. Identification of any potential problems likely to be encountered in the process of conducting the test.
3. Establishing the period required for testing.
4. Providing training to the assisting staff in test administration techniques.
5. Identification of mistakes likely to happen during the test.
6. Standardization of the exercises used, the training load in plyometric exercise, and the components of the training load.

Field Procedures of the Study

Pre-Tests

The pre-tests were conducted on Saturday, 04/02/2023, at 2:00 p.m. in the indoor hall of the Directorate of Sports and Scouting Activity in Diyala.

Plyometric Training Program:

The specific exercises, designed for training lower limb muscles, were invented with the help of the researcher's previous experience as a coach at Diyala Directorate of

Education sports clubs. The purpose of the exercise program was to strengthen various aspects of muscles related to shooting movements.

The training load was structured as follows:

- Intensity: 80%–100%
- Volume: Determined by the number of repetitions according to intensity levels
- Rest Intervals: Regulated using heart rate as an indicator
- Between repetitions: 100–120 beats per minute
- Between sets: 100–120 beats per minute

The whole process took two months, involving eight weeks and twenty-four training lessons. These lessons were done on Sundays, Tuesdays, and Fridays. The training was incorporated in the primary part of the training lesson during the preparation stage. Within the lesson period, the time allocated for the special training program ranged from 25 minutes to 35 minutes. The plyometric training exercise started on Tuesday, 07/02/2023, and ended on Sunday, 02/04/2023.

Post-Tests:

The post-test was conducted after completing the training program (24 training sessions) on Friday, 07/04/2023, under similar circumstances to those used during the administration of the pre-test.

Statistical Methods

The researcher used the suitable statistical tests in analyzing the collected information from the pre and post tests, through the SPSS package.

Result and Discussion

The researcher presented and interpreted the results to assess the influence of plyometrics exercises on the acquisition of explosive strength, speed-strength, and shooting technique in futsal. The analysis was done taking into consideration the techniques used to conduct the statistical tests in the research, which ensured the appropriateness of the data obtained. This step was aimed at verifying the research hypotheses in accordance with the field methodology and techniques used in the research. The results were further interpreted with respect to the existing scientific literature..

Table 1. This table presents the values of the arithmetic means, standard deviations, mean differences, standard deviations of the differences from their mean, as well as the calculated and tabulated t-values, and the significance of differences between the pre- test and post-test for both the experimental and control groups across the study variables.

No.	Variables	Group	Pre-Test Mean	Pre-Test SD	Post-Test Mean	Post-Test SD	Mean Difference	SD of Differences	Calculated t-value	Significance Level	Significance
1	Explosive Power of the Legs	Experimental	1.30	0.54	1.85	0.24	0.55	0.15	5.789	0.000	Significant
		Control	1.25	0.63	1.40	0.31	0.15	0.10	2.380	0.003	Significant

2	Speed–Strength of the Legs	Experimental	18.24	2.31	26.14	1.68	7.90	2.03	6.090	0.000	Significant
		Control	18.53	2.62	21.45	2.30	2.87	1.34	3.352	0.000	Significant
3	Shooting	Experimental	5.67	2.62	12.89	2.12	7.22	2.14	5.281	0.000	Significant
		Control	5.90	2.86	8.46	2.27	2.56	1.83	2.189	0.004	Significant

Table (1) shows that the values of the arithmetic means, standard deviations, difference of means, deviation of differences from their arithmetic mean, calculated and tabulated (T) value, and significance of differences in the pre- and post-tests for the experimental and control groups in the research variables are as follows:

1. Explosive Power of the Legs:

   It was found that the mean values for the experimental group in explosive power of the legs were (1.30) in the pre-test with a standard deviation of (0.54), while in the post-test they were (1.85) with a standard deviation of (0.24). The difference between the means was (0.55), and the difference between the deviations was (0.15). The calculated t-value was (5.789), and the margin of error was (0.000) at a significance level of (0.05) and (6) degrees of freedom. Thus, the calculated t-value is greater than the margin of error, which means there are statistically significant differences between the pre-test and post-test, in favor of the post-test.

   The mean scores for the control group in explosive power for the two men were (1.25) in the pre-test with a standard deviation of (0.63), while in the post-test they were (1.40) with a standard deviation of (0.31). The difference between the means was (0.15), and the difference between the deviations was (0.10). The calculated t-value was (2.380), and the margin of error was (0.003) at a significance level of (0.05) and degrees of freedom of (6). Thus, the calculated t-value is greater than the margin of error, which means there are significant differences between the pre-test and post-test, in favor of the post-test.

2. Speed-Strength of the Legs :

   The mean scores for the experimental group in Speed-Strength of the Legs were found to be 18.24 in the pre-test (standard deviation 2.31) and 26.14 in the post-test (standard deviation 1.68). The difference between the means was 7.90, the difference between the deviations was 2.03, the calculated t-value was 6.090, and the margin of error was 0.000 at a significance level of 0.05 with 6 degrees of freedom. Therefore, the calculated t-value is greater than the margin of error, indicating a statistically significant difference between the pre-test and post-test, favoring the post-test.

   The mean scores for the control group in the Speed-Strength of the Legs ratio for the two men were (18.53) in the pre-test with a standard deviation of (2.62), while in the post-test they were (21.45) with a standard deviation of (2.30). The difference between the means was (2.87), and the difference between the deviations was (1.34). The calculated t-value was (3.352), and the margin of error was (0.000) at a significance level of (0.05) and degrees of freedom of (6). Thus, the calculated t-value is greater than the

margin of error, which means there are significant differences between the pre-test and post-test, in favor of the post-test.

3. Shooting Skill:

It was found that the mean scores for the experimental group in target shooting skill were (5.67) in the pre-test (standard deviation 2.62) and (12.89) in the post-test (standard deviation 2.12). The difference between the means was (7.22) and the difference between the deviations was (2.14). The calculated t-value was (5.281) and the margin of error was (0.000) at a significance level of (0.05) and with (6) degrees of freedom. Therefore, the calculated t-value is greater than the margin of error, indicating a statistically significant difference between the pre-test and post-test, favoring the post-test.

The mean scores for the control group in the shooting skill were (5.90) in the pre-test with a standard deviation of (2.86), while in the post-test they were (8.46) with a standard deviation of (2.27). The difference between the means was (2.56), and the difference between the deviations was (1.83). The calculated t-value was (2.189), and the margin of error was (0.004) at a significance level of (0.05) and degrees of freedom of (6). Thus, the calculated t-value is greater than the margin of error, which means there are significant differences between the pre-test and post-test, in favor of the post-test.

According to Table (1), after statistical analysis, we found differences between the pre-tests and post-tests for the control and experimental groups, in favor of the post-tests, which indicates the success of the training and the achievement of its goals. “Appropriate and effective exercises with the level of the players enable the coach to improve and develop the physical aspects and at the same time work on mastering the skill performance” (16: 86), as Shaalan (2009) indicates, “Strictly organized and standardized training programs according to scientific principles work to develop the physical and skill level of the players” (10: 126).

Plyometric training is one of the most popular training methods for all levels, ages, and abilities. The strong need for strength and speed, which are essential in most sports movements, is a factor that facilitates achievement in various championships. Training scientists believe that "plyometric training is the link between muscular strength and ability on the one hand, and it is the main approach to improving performance through these two qualities, with muscular strength as a basic quality. Plyometric training is directing these forces in their appropriate paths to raise the level of performance speed" (12:79).

The principle upon which plyometric training is based is the stretch-shortening cycle. When a muscle is stretched by contracting in an eccentric manner, it lengthens and produces elastic energy that can be stored. If the muscle contracts eccentrically (shortens when it contracts), that elastic energy can be used to increase the force of contraction. The best example of this is jumping. If the player jumps vertically, he will land steadily before rising quickly by lowering the center of gravity by stretching the working muscles and allowing them to contract more forcefully for the next jump. That is, if the muscle is stretched before it contracts, it will contract more forcefully (7: 127).

Plyometric exercises can be used for all ages in various training fields with appropriate regulation of work to their abilities, as plyometric exercises work positively to

improve kinetic energy and elastic energy, which have a great effect on developing explosive power through the cycle of lengthening and shortening of muscle fibers, and affect the rapid response of muscles as a reaction carried out by muscle spindles. (1:37)

The results appeared as the researcher expected in his first hypothesis, which states that there are significant differences in the effect of plyometric exercises on developing explosive and speed-strength leg strength and long-range shooting skill. The researcher attributes this to the fact that there are several variables that interacted in the plyometric exercises, which included explosive strength exercises in a new way to increase strength and speed simultaneously, as well as standing long jumps, vertical jumps, and kicking the ball from a distance towards the target. All of these contributed significantly to developing the working leg muscle strength involved in long-range shooting skill in different positions, which enhanced the loading of muscles with stretching loads, which in turn developed the efficiency of the extension and contraction relationship in the muscle. Also, when developing leg strength, "there is a correlation between increasing leg muscle strength and the results of explosive power, which is expressed in the vertical jump." (13: 137)

Plyometric training can be considered a process of linking muscular strength and power, and it is related to improving the performance level of the appropriate force pathways to raise the speed of performance. The physiology of the common pathways leads to plyometric ability in order to improve the possible improvement of neural pathways and neuromuscular cooperation during training, which leads to an increase in force output through improving the cooperation of muscle groups. (6: 216)

Here it must be noted that achieving long-range shooting in futsal "can be achieved by producing the highest possible power in the shortest possible time. This is characterized by plyometric exercises, which are distinguished by high intensity and relatively small volume, thus creating a link between power and speed. Therefore, the plyometric exercise method is the ideal method for developing the ability that is expressed as the product of (power × speed)." (15:25)

Table 2. This table presents the arithmetic means, standard deviations, calculated t-values, error rates (significance levels), and the statistical significance of the post-test results for both the experimental and control groups across the study variables.

No.	Research Variables	Unit of Measurement	Experimental Group (Mean ± SD)	Control Group (Mean ± SD)	Calculated t-value	Significance Level (Sig.)	Statistical Significance
1	Explosive Power of the Legs	Distance	1.85 ± 0.24	1.40 ± 0.31	2.848	0.003	Significant
2	Speed–Strength of the Legs	Distance	26.14 ± 1.68	21.45 ± 2.30	4.036	0.000	Significant
3	Shooting Accuracy Test Score in Futsal		12.89 ± 2.12	8.46 ± 2.27	3.496	0.000	Significant

Table (2) shows that the mean scores for the post-test for the experimental group in the research variables were better than those for the control group, as there are significant differences between the two groups in the post-tests in the research variables, in favor of the experimental group, as follows:

1. Explosive Power of the Legs: -

   It was found that the mean values of the explosive power of the legs for the experimental group reached (1.85) with a standard deviation of (0.24), while for the control group it reached (1.40) with a standard deviation of (0.31). The calculated (t) value was (2.848) and the margin of error was (0.003) at a significance level of (0.05) and degrees of freedom of (10). Thus, the calculated (t) value is greater than the margin of error, which means there are significant differences between the experimental and control groups, in favor of the experimental group.
2. Speed-Strength of the Legs:

   It was found that the mean values for the force-bearing strength of the arms for the experimental group were (26.14) with a standard deviation of (1.68), while for the control group they were (21.45) with a standard deviation of (2.30). The calculated t-value was (4.036), and the margin of error was (0.000) at a significance level of (0.05) and degrees of freedom of (10). Therefore, the calculated t-value is greater than the margin of error, indicating a significant difference between the experimental and control groups, favoring the experimental group.
3. Shooting Skill:

   It was found that the mean values for the strength endurance of the arms for the experimental group were (12.89) with a standard deviation of (2.12), while for the control group they were (8.46) with a standard deviation of (2.27). The calculated t-value was (3.496), and the margin of error was (0.000) at a significance level of (0.05) and degrees of freedom of (10). Therefore, the calculated t-value is greater than the margin of error, indicating a significant difference between the experimental and control groups, favoring the experimental group.

The superiority of the training used can be observed in Table (3), which explains that the differences between the control and experimental groups were in favor of the experimental group in the research variables. This is attributed to the plyometric training used, which focused on the effective power of the skill performance for scoring in futsal. The researcher believes that the method he adopted in constructing plyometric exercises within the framework of the daily training unit and throughout the period of implementation of this program by this group, with an emphasis on providing appropriate and precise repetitions that correspond to the players' abilities at this stage, and the continuous guidance from the coach in motivating the players to perform these exercises, while working to correct errors through repetitions programmed in the unit for the sample to perform, contributed to the positive effects on the players' level. The researcher attributes this result to the exercises he used, which were scientifically and precisely designed, avoiding randomness by shaping the training load and changing its proportions and types according to the training objective and the methods and techniques used, providing appropriate rest periods between exercises and between sets of applied exercises, as well as creating an atmosphere of enjoyment and fun during performance, which is what The rapid and effective development of the experimental group's performance in the tests was a significant indicator of the progress of the research variables, as well as the successful

completion of the exercises by the research sample throughout the training period. It should be noted that plyometric training is one of the most important techniques applied to develop futsal players' performance because the latter requires a lot of speed, short-time actions, and frequent change of movements (24:29).

The superiority of the training method used is explained by the fact that the exercises used were effective for improvement of muscular strength in female futsal players. In addition, such an achievement of the research proves the effectiveness of the use of properly arranged plyometric training for the increase of explosive and speed-strength abilities of the athletes. According to the literature sources, plyometric training includes different types of exercises – hopping, hurdle jumps, rebounds, and depth jumps that aim at the development of explosive and speed-strength abilities (23:68).

Moreover, development of lower limbs muscles allows the improvement of physical and technical performance of futsal players due to its rapid and fast offensive and defensive changes. This fact proves that muscular strength is required for the performance of females in futsal since the success of football is determined by the ability of the players to show their physical abilities and perform a high level of skill in such actions as powerful long-distance shooting (9:38).

Considering the above-mentioned facts, the quadriceps is one of the main muscle groups that help in the improvement of running and shooting performances, which is why futsal players attach great importance to its strengthening. Plyometric training is considered to be the most effective way to accomplish the task because it implies such exercises as vertical jumps, repeated jumps, and box drills where there is a necessity to work with the quadriceps (25:89).

“Organized and programmed training, the use of standardized intensity types in training, and the use of optimal types of rest between repetitions lead to the development of performance. The process of overcoming resistance by performing a specific movement and completing it at maximum speed or in the shortest possible time is achieved in the service of explosive power. By repeating this, the effectiveness of speed-strength increases, since speed-strength is a group of several explosive powers.” (21:34)

The correct and continuous execution of these exercises will reduce reaction time, thus adapting the players to this purpose and providing an opportunity to refine their talents. The more repetitions there are of the response to a specific stimulus, the faster the decision will be made, thus shortening the reaction time and increasing its speed. The correct execution of the response from one attempt to another will be better, and the more attempts there are, the shorter the reaction time will be due to the effect of those attempts. “The basic principle for developing strength and speed is the repetition of performance, that is, the repeated appearance of the stimulus and the response to that stimulus. The response time is shortened while taking into account the training on it without separating it from the nature of the basic movement or athletic skill” (5:38).

The researcher believes that the development in the long-range shooting skill in futsal was due to organized repetition according to scientific principles. “Repeating the skill exercise as many times as possible, taking into account rest periods, preferably positive

ones, provides a sufficient opportunity for the player to master the skill and perform it better, because practicing the complex skills a lot and repeating them correctly helps to perform them properly during the game" (18: 230).

The development of physical abilities has greatly helped in the development of basic skills. "Many experts and specialists in the field of training science advise the necessity of developing skill performance through the development of the physical abilities specific to each activity, because performing sports movements requires special physical abilities that are performed in an interconnected manner, as they ultimately result in obtaining correct skill performance." (20: 221), "The higher the level of development of the physical and motor abilities of the player, the better the skill abilities will develop." (17: 156).

The development in physical abilities also has a clear impact on the development of the players' level in performing the skill of scoring from a distance in futsal. "Skill abilities play a prominent role in any sporting activity and are the backbone in achieving the goal. Skill abilities are closely related to specific physical abilities, as mastery of skill performance depends on the extent of developing the performance requirements of specific physical abilities and skill abilities" (3:67). "Motor performance is the product of neuromuscular effort, and training and repetition in succession increases and strengthens the relationship between the central nervous system in the brain and the muscles, which leads to reducing and neglecting external stimuli and influences in the performance of the movement. Therefore, succession in performance leads to a change in the body towards improving the physical and skill abilities of the sport" (19:114). "Specific physical abilities are important in mastering the basic skills in futsal" (22:40).

Conclusion

1. The application of plyometric training in the experimental group led to the development of players' lower limb muscular strength and the ability to perform long-range shots in futsal. Such results were achieved due to the scientific nature of repetitions of the given exercises.
2. The experience of the players gained as a result of constant practice and repetitions helped in improving physical and technical abilities of players because perception and action get better with practice.
3. Plyometric training increased motivation, enthusiasm, and competitiveness of players, improved team collaboration, coordination, and perseverance and helped to gain muscular strength and shooting skills.
4. Explosive power and speed–strength have a positive effect on the development of skills to perform long-range shots in futsal.
5. The results showed that linking physical training (plyometric exercises) with skill performance leads to integrated development in performance and improved neuromuscular coordination, resulting in better shooting accuracy.

Recommendations

1. Plyometric training techniques can be applied for developing other physical qualities as well.
2. Explosive power and speed–strength need special attention from coaches as they contribute to improved physical and technical abilities of female futsal players.
3. Developing physical qualities requires scientifically planned work as this helps to achieve good results.
4. Integrate plyometric exercises with skill-based drills, such as shooting, within training sessions to achieve optimal results.
5. Conduct future studies that link plyometric exercises with other variables such as agility and balance.

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