

Analysis of physical exercises to improve physical abilities and shooting in young basketball players

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ABSTRACT

The science of athlete training and physiology has an important role in developing basketball athletes, especially for teenagers. Training causes many changes, whether it is physical or internal. The aim of this study was to prepare proposed exercises to develop some physical abilities, the functional variable and two-point jump shot in young basketball players, as well as to identify the effect of the proposed exercises on some physical abilities, the functional variable and two-point jump shot. The researcher used the experimental method. A total of 20 young basketball players of Nasiriyah Basketball Club were selected to participate in the study and were classified into experimental and control groups. Data were analyzed using T-test and Pearson's correlation. The results showed that there were statistically significant differences ($p < 0.05$) in the pre and post-tests for some physical and functional abilities and two-point jump shot in favor of the post-tests and in both groups (experimental and control). In conclusion, this study in young basketball players confirmed that continuing training by following the scientific methods and properly graduating the exercises placed in the main section of the training unit leads to achieve the desired goal when conducting the exercises consistently.

KEYWORDS

Development; Physical abilities; Two-Point Jump Shot; Basketball.

1. INTRODUCTION

The crucial sciences that have contributed to the improvement and development of sports performance level in basketball are sports training and physiology sciences. As it is known, training leads to many changes, whether they are physical changes due to the development of the physical characteristics of the type of physical activity performed, or internal changes that occur as a result of sports training, which include functional changes in the various body systems and depending on the type of training (López et al., 2022). Many sources of sports training indicate that training programs can achieve the development of remarkable physiological capabilities required for the performance of the sports activity (González et al., 2020; Sánchez et al., 2019). After the researcher examined the scientific resources on the physiology of sports training in addition to conducting meetings and interviews with experts and specialists in the field of sports training physiology, he chose the functional variable to conduct the entirety of his work on it and to learn the real reasons behind his weakness and to reach the best level of the chosen functional ability in the research. The game of basketball is one of the differential activities that require extraordinary physical preparation to increase the player's efficiency and ability to play this game. Through the researcher's observation of a group of training units for young players in addition to his follow-up of youth basketball matches, the researcher noticed a weakness in the performance of the shooting skill by jumping two points inside the forbidden area, especially in the third and fourth periods of the match. This is a clear indication of a weakness in the training to develop this skill to obtain essential results for it, and because of its influential role during the matches, as the result of matches is often deducted through correction by jumping with two points. From here comes the importance of research in identifying the impact of the proposed exercises on some functional variables and physical abilities and the performance of two-point jump shots.

Researchers in the basketball game are still working on solving the problems that would continue to push forward the wheel of study and continuous scientific research, as this leads to "achieving good results, more effective and a team that always wins (Ismail, 1996). Any weakness suffered by any basketball team is an important problem, so it must work to overcome that weakness, whether it is physical or related to the internal organs of the player's body and turn it into a point of strength and benefit from it. One of the most important thing that a basketball player should be distinguished by is to complete the match in its four periods, preserving his speed and strength despite the long period of performance, as well as to perform his skills with high efficiency and to implement the game plans with extreme accuracy and this depends on the development of

special physical abilities that are compatible with those requirements. Since the researcher is one of the Iraqi basketball premier league players as well as follows up youth tournaments inside Iraq, he noticed that most of the young players' physical and skill performance declines during the third and fourth period of the official match, and this is what negatively affects the match results. In particular, there is a problem in the field of physical and skill abilities (leg muscle strength, speed endurance, and two-point jump shot), and from here lies the problem of this research. Accordingly, the researcher proceeded to explore this problem by using suggested exercises to develop physical abilities and two-point jump shot, developing functional variables and obtaining the best results for them to provide an accessible service to the beloved basketball.

This study aimed to prepare exercises to develop some physical abilities, the functional variable and two-point jump shot in young basketball players. The second objective of the present study was to identify the effects of the proposed exercises on some physical abilities, the functional variable and two-point jump shot in young basketball players. The third objective was to identify the differences in the research variables (physical abilities, the functional variable and two-point jump shot) between the experimental and control groups in the post-test.

The hypotheses of the research were two. First, the authors hypothesized that there would be statistically significant differences in the pre and post-tests for some physical and functional abilities and two-point jump shot in young basketball players. Second, the authors hypothesized that there would be statistically significant differences between the experimental and control groups in the post-tests in favor of the experimental group.

2. METHODS

The nature of the problem presented, determines the nature of the approach, so the researchers used the experimental method in the manner of the control and experimental groups, which is the closest and sincerest method to solve many scientific problems, practically and theoretically (Allawi & Ratib, 1999). Also it is compatible with the nature of the research problem as experimentation is one of the most efficient means to obtain reliable knowledge.

2.1. The society and the sample of the study

The objectives of the researcher describe the research and the procedures he/she uses, determine the nature of the community and the sample they select (Allawi & Ratib, 1999). The research community included young players of Nasiriyah Basketball Club, aged 16-18 years and, of

a total of 28 players, 20 were selected. The players excluded were those who were injured or not committed to the training units.

2.2. Homogeneity of the sample

To achieve homogeneity among the members of the research sample and to avoid the influence of factors that may affect the results of the experiment in terms of individual differences that exist in the sample within the group, the researcher conducted a process of homogeneity of the sample in some specifications that may affect the experimental variable (height, weight, chronological age, training age), being the coefficient of variation lower than 30%, which confirms the homogeneity of the sample members (Table 1). The researcher also conducted parity analysis between the control and experimental groups in each of the following areas: physical abilities, functional variables, and two-point jump shot (Table 2).

Table 1. The homogeneity of the research sample in terms of specifications, unit of measurement, arithmetic mean, standard deviation and coefficient of variation.

n	Specifications	Unit of measurement	Arithmetic mean	Standard deviation	Coefficient of variation (%)
1	Height	cm	178	0.03	1.69
2	Weight	kg	71.45	2.58	3.61
3	Age	Months	204.46	7.74	3.78
4	Training age	Months	35.80	4.21	11.75

Table 2. Equivalence of the control and experimental groups in the research variables.

n	Variables	Unit	Experimental group		Control group		t value	p value
			M	SD	M	SD		
1	Speed endurance	s	4.53	0.02	4.55	0.14	1.96	>.05
2	Leg muscle strength	m	17.73	5.47	18.86	1.93	0.59	>.05
3	Heart rate after effort	heartbeats	184.08	2.63	186.08	3.63	1.41	>.05
4	Two-point jump shot	points	15.2	1.398	14.5	1.354	1.137	>.05

Level of statistical significance: $p < 0.05$

2.3. Procedures, materials and instruments

The authors carried out a literature review about the topic. Also, they conducted personal interviews with experts in the field of basketball and sports training to decide the variables of the study. The materials that were used for the implementation of the tests used in this study were: 8 chairs, 1 legal basketball court, 25 Moltem basketball balls, 1 centimeter tape measure, 1 Nikon camera, 1 Asus ROG computer, 1 calculator, 1 adhesive tape, 2 Moltem electronic stopwatches, 2 Moltem whistles, 20 signs, 1 medical scale to measure weight, 1 Samsung external hard drive to store the search information with a storage capacity of 1 Terabyte, and 1 Rossmax device to measure the heart rate after exertion. The test used in this study are described in the following paragraphs.

Leg muscle strength

The test consisted of forward jump with both legs within 10 seconds (Hassanein, 1995). The purpose of the test was to measure the force characteristic of the velocity of the muscles of both legs. The tools used for this test were: flatbed area, tape measure, stopwatch, whistle, chalk. To conduct this test, the participant remains on the starting line, and when the participant starts, the beeper is heard and the stopwatch starts. The participant starts at full speed by leaping forward with both legs from the start whistle until the timing reaches 10 seconds, and then the distance covered by the participant during the test time is calculated. The distance covered is measured in meters.

Speed endurance

The test used was 30m sprint x 5 times (Hassanein, 1995). The player had to repeat a sprint of 30 m five times, while resting for 30 seconds between each attempt, which is a light run to return to the starting point. As for the scoring method, the time is calculated to the nearest 1-10 seconds.

Physiological test

The physiological variable was measured with a Swiss-made (Rossmax) device by the researcher and the assistant work team. This indicator was measured after the effort for the control and experimental groups. The measurement method was done after performing the exercises used in the research by recording a reading of the device three times for each player and then extracting the

arithmetic mean of the three readings, by placing the player on a chair with an armrest to place the hand on it and place the device on his left hand and apply this procedure before and after the effort.

Two-Point Jump Shot

The objective of this test was to measure the player's skills in aiming at the basket (Husayn & Ahmad, 1979). For this test it is necessary a basketball court, timing and a data collection form. The participant aims at the basket from a point outside the free-throw area, and when it intersects with the circle, a signal must be installed in the area designated for correction .Test conditions: 1- The tested sample can aim by any method. 2- The goal must be directed at the basket without touching the basket plate. 3- There are 15 attempts in three groups, each group comprising 5 throws. 4- The correction must be done from the place specified for the players. 5- It is allowed to make some throws as a test. Scoring: One point is counted for each shot where the ring is touched and the ball does not enter the basket. Two points are counted for each successful shot that the ball enters into the basket. Scores are not calculated when the ball hits the board. The highest possible score is 30 points.

2.4. The first exploratory experiment

The researcher conducted his first exploratory experiment on a sample consisting of 10 players from the Al Furat Sports Club in Basketball for Youth, with the help of the Auxiliary Work Team after explaining the tests and registration to them. The experiment was carried out on 1/8/2019, on Thursday. The experiment lasted for one day and it was divided in physical and physiological tests and correction by jumping with a ball. The objectives of this first exploratory experiment were:

- 1- Identify the difficulties and problems faced by the researcher while conducting the tests.
- 2- Identify the time taken for each exercise and test.
- 3- Appropriateness of the tools and devices used in the test.
- 4- Conducting physiological measurements of the pulse after the exertion by using the Rossmax device, where this parameter is measured directly after the completion of the exercise application
- 5- Determination of the appropriate loads for each exercise.

The honesty, stability and objectivity of each test were also checked in this first exploratory experiment:

- *Honesty*: Honesty means that the test task is to measure and evaluate the characteristic for which this test is used. There are several methods for measuring the validity of the tests, including face-to-face truthfulness (Kazem, 2015), which is the method used in this study to find the validity of the tests.

- *Stability*: The researcher sought to extract the coefficient of stability through the use of the test method and return it to the pilot sample after a week had passed, as all tests were repeated on Thursday 29/8/2019, and the researcher used the law of correlation coefficient (Pearson), to extract the stability coefficient. The physical skill and functional tests had a high degree of stability, as shown in Table 3.

Table 3. The stability of research variables.

n	Variables	Stability
1	Leg muscle strength	0.99
2	Speed endurance	0.96
3	Two-point jump shot	0.98

- *Objectivity*: Calculating scores in the tests used in the research was limited to a time or a number and was objective in itself.

2.5. Exercises

The researcher prepared exercises to develop the leg muscle strength and speed endurance for both legs. The exercises also aim to develop the skill of two-point jump shot in young basketball players. The researcher used exercises with the method of high-intensity interval training.

The research approach included vocabulary for developing the strength of the muscles of both legs and speed endurance, as well as for developing the ability of two-point jump shot, in addition to measuring the number of heartbeats after the effort, after applying the exercises. Therefore, the researchers decided to provide special exercises on 24 training units at a rate of 3 units per week, for 8 weeks, and the work of the experimental group was to apply the exercises prepared by the researchers. The vocabulary of the training curriculum was applied during the

particular preparation period, in the same hall where the research sample was trained. It was taken into account the relationship between the components of training load (intensity, size, comfort). The approach was applied on 1/9/2019, on Sunday, until 31/10/2019 on Thursday, during Sunday, Tuesday and Thursday of each week, in the Martyr Haider Kamel Burhan closed sports hall.

2.6. Statistical Analysis

The Statistical Package for the Social Sciences (SPSS version 24) was used for data analysis. The researcher used pre and post-tests to measure statistical parameters of the variables of physical abilities of both groups (control and experimental). To measure the stability of research variables the Pearson’s correlation coefficient was used.

3. RESULTS AND DISCUSSION

The following table 4 presents the results of the pre and post-tests of the experimental group in all research variables.

Table 4. Statistical parameters of the pre and post-tests of the variables of physical abilities of the experimental group.

n	Variables	Unit	Pre-test		Post-test		t value	p value
			M	SD	M	SD		
1	Speed endurance	s	4.53	0.02	4.13	0.02	2.94	<.05
2	Leg muscle strength	m	17.73	5.74	25.79	3.34	3.83	<.05
3	Heart rate after effort	heartbeat	184.08	2.63	179.03	1.17		<.05
4	Two-point jump shot	points	11.42	0.981	0.981	1.05	5.52	<.05

Level of statistical significance: p < 0.05

The value of T calculated for all tests was more significant than its tabular value in the research variables, and this indicates the statistically significant differences between the pre and post-tests of the experimental group and in favor of the post-tests. A uniform pace, in form and content, leads to suspense and the development of devices and members and the importance of that

appears in the preparation stages (Al-Basati, 1998). "The development of strength characterized by speed gives the possibility of raising the technical level to the same degree" (Al-Basati, 1998).

Ahmad & Al-Samarrai (1984) stated: "Exercises are organized and purposeful movements through which they obtain the development of motor qualities and skills in the field of life and sport" (Hara, 1975). The heart gradually adapts to a lower rate than its beats, reinforcing that the pulse is a physiological and objective expression and an accurate indication of the intensity of efforts and the degree of adaptation. The physiological adaptations occur in the vital body systems, especially the circulatory system of the research sample, and when the arithmetic mean of the heart rate is observed after the effort, we find it is indicating the maximum intensity required for the test. This indicates the excellent and advanced physiological state occurring in the heart muscle. The researcher also attributes the reason for the development in the skill of two-point jump shot to the effect of physical exercises that were applied to the research sample.

Khaleq (1989) mentions that the development of strength characterized by velocity is done either by developing maximum strength or raising muscle contraction, and the components of the two must be linked to raising the level of characteristic strength with speed (Ahmad & Al-Samarrai, 1984). By observing the results that appeared in the development of the performance of the experimental group in the dimensional measurements as a result of the effect of exercises developed by the researcher during the implementation period of the curriculum and represented by physical exercises, we can say that the exercises contributed to enhance the capabilities of the players and had a positive impact on the development of the experimental group.

Next, Table 5 presents the results of the pre and post-tests of the control group in all research variables.

Table 5. Statistical parameters of the pre and post-tests of the variables of physical abilities of the control group.

n	Variables	Unit	Pre-test		Post-test		t value	p value
			M	SD	M	SD		
1	Speed endurance	s	4.55	0.011	4.20	0.04	22.67	<.05
2	Leg muscle strength	m	18.86	1.93	19.26	1.56	2.28	<.05

3	Heart rate after effort	heartbeat	186.08	3.63	185.26	6.40	2.77	<.05
4	Two-point jump shot	points	14.5	1.354	16.7	1.702	8.820	<.05

Level of statistical significance: $p < 0.05$

The following table 6 presents the sample exercises and training modules used in this research. The training unit intensity was 80%.

Table 6. The sample exercises and training modules used in the research.

n	Name of the exercise	Iterations	Rest between iterations	Groups	Rest between groups	Working time for one exercise	Total exercise performance time
1	Lift the knees back-to-back	4	45 s	3	90 s	7.32	13.46
2	Hip hit back-to-back	4	45 s	3	90 s	6.45	13.29
3	Running distance 30 m	4	45 s	3	90 s	7.33	13.64
4	Running distance 40 m	4	45 s	3	90 s	8.1	14.2

Based on the Table 5 the value of T calculated for all tests was more remarkable than its tabular value in the research variables, and this indicates the statistically significant differences between the pre and post-tests for the control group and in favor of the post-tests. Almost all levels of athletic performance progress whenever these changes are positive to achieve the physiological adaptation of the body's systems to perform the physical load and endure performance with high efficiency and with lower effort (Al-Jabour, 2011).

The researcher attributes the control group's development to the continuity and adherence to the training curriculum prepared for them by the trainer and the application of his exercises, which led to the development of the level of the players in physiological terms. The result was an increase in the level of sports, and many sources and studies in the field of sports training have confirmed that the difference in the proportions of physical characteristics in the process of building the

athletic level is very likely (Al-Jabour, 2011). There is a reciprocal relationship between physical abilities and skill levels, as physical abilities affect the improvement of the skill level of various team games, especially basketball. According to Khuraibet, attacking in basketball is the accurate correction, while the many other methods are only auxiliary methods to reach the goal and perform the accurate shot to the basket (Khuraibet, 1988).

The researchers believe that preparing the player physically to meet the requirements of the sports activity is one of the main duties of the training process, which leads to the progression of the player's training status to reach high levels in the sporting activity. The basketball player must perform at a high level characterized by speed and the player also must jump to the highest possible height and continue this jump to place the ball in the basket, or score from the jump, or follow the rebound balls under the conditions of conflict with the opponent (Mohamed, 1980).

This study was limited to young basketball players of the Nasiriyah Sports Club between the ages of 16 and 18 years. The spatial limit was the Martyr Haider Kamel Burhan Closed Sports Hall in Dhi Qar Governorate (Iraq). The time limits were from 1/9/2019 to 31/10/2019.

4. CONCLUSIONS

In conclusion, this study in young basketball players confirmed that continuing training by following the scientific methods and properly graduating the exercises placed in the main section of the training unit leads to achieve the desired goal when conducting the exercises consistently.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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