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The Effect of HIIT Training on some Types of Special Endurance and Box out and Rebound Skills for Young Basketball Players

تأثير تدريبات HIIT في بعض انواع التحمل الخاص ومهارة box out and rebound للاعبي كرة السلة الشباب

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Abstract:
Basketball training is characterized by speed, that is, a high ability to perform box out and rebound movements. Basketball requires high physical preparation and scientifically codified workouts designed to improve the athletes' physical capabilities to complete the match, especially in the last quarter of it. This sport also requires the safety and efficiency of the nervous system, which is what basketball needs of high concentration while maintaining high energy levels throughout the playing period. Therefore, the research study aimed to use high-intensity interval training for the purpose of developing the physical efficiency that a basketball player needs and resisting muscle fatigue. Therefore, it requires increasing the player's efficiency in endurance for the play and the skill of box out and rebound, which are among the important skills that players use. Two equal groups participated in the experiment conducted by the researcher. Concerning the study sample, it was represented by young male basketball players in Al-Karkh Sports Club, numbering 14 players. High-intensity interval training (HIIT) was applied to the research sample at a rate of three units per week and at a rate of 24 training units, which allowed the intensity of the instruction to be defined in a way that matched the play's intensity and the method's nature. Subsequently, the study variables underwent pre-tests, and the researcher utilized the statistical software SPSS to extract the research findings. from which the researcher concluded that HIIT training had a significant impact on the variables investigated (strength endurance, speed endurance, box out and rebound). In light of this, the researcher recommends the necessity of following training at high levels similar to the playing environment to adapt the players' functional organs and to avoid rapid drops in the players' level during play.

4-Keywords: **HIIT training - special endurance - box out and rebound.**

الملخص :

تمتاز تدريبات كرة السلة بطابع السرعة أي القدرة العالية على اداء الحركات الهجومية والدفاعية وان لعبة كرة السلة تتطلب اعداد بدني عالي وتدريبات مقننة بشكل علمي لغرض رفع القابليات البدنية للاعبين لاكمال المباراة وخاصة في الربع الاخير من المباراة كما تتطلب اللعبة سلامة وكفاءة الجهاز العصبي لما تحتاجه كرة السلة من تركيز عالي مع الحفاظ على مستويات الطاقة العالية طيلة فترة اللعب .لذا هدفت دراسة البحث الى استخدام تدريبات عالية الكثافة لغرض تطوير الكفاءة البدنية التي يحتاجها لاعب كرة السلة ومقاومة التعب في العضلات لذا يتطلب زيادة كفاءة اللاعب في التحمل الخاص باللعبة ومهارة **box out and rebound**,والتي تعد من المهارات المهمة التي يستخدمها اللاعبين واستخدم الباحث المنهج التجريبي ذو المجموعتين المتكافئتين اما عينة البحث فتمثلت بلاعبي السلة الشباب في نادي الكرخ الرياضي البالغ عددهم 14 لاعبا وقد طبقت التدريبات عالية الكثافة (HIIT) على عينة البحث بواقع ثلاثة وحدات اسبوعيا وبواقع 24 وحدة تدريبية تم من خلالها تقنين الشدد التدريبية بما يتلائم مع طبيعة الاسلوب المتبع وشدة اللعب بعدها تم اجراء الاختبارات البعدية لمتغيرات البحث , وقد استخدم الباحث البرنامج الاحصائي SPSS لاستخراج نتائج البحث ومنها استنتج الباحث ان تدريبات HIIT قد اثرت بشكل كبير في المتغيرات المبحوثة (تحمل القوة _ تحمل السرعة_ **box out and rebound**) وفي ضوء ذلك يوصي الباحث على ضرورة اتباع تدريبات بشدد عالية مشابهة لبيئة اللعب لتكيف الاجهزة الوظيفية ولتفادي هبوط المستوى السريع للاعبين اثناء اللعب.

4-**الكلمات الدالة** تدريبات HIIT – التحمل الخاص – box out and rebound .

1-1 Overview of the Study and Its Significance:

Training science relies heavily on other sciences, which complement the modern training process by relying on laboratory and field experiments. Physiology is one of the important and basic sciences to advance the reality of training by revealing the effects of training and the level of development of the body's functional systems, as well as the work of glands and enzymes and the effect of each of them on physical effort and energy expenditure, as well as the major role in regulating stress and the safety of players and achieving great training results, especially in high-intensity sports. Basketball is one of the sports whose workouts are known for their comparatively intense nature. accompanied by large accumulations of lactic acid, so it requires that the exercises be structured and codified in a sound and scientific manner that effectively contributes to the occurrence of real

adaptations and with planned time periods, in addition to proper nutrition. The game of basketball is one of the games that demands a lot of work, and this prompts those in charge of this sport to choose exercises that suit the type of intensity because the body's responses to high intensity allow the player to adapt to the nature of the performance in terms of increasing energy stores or resisting the buildup of lactic acid within muscular tissue.
Thus, the significance of doing studies using high-intensity interval training (HIIT) in an environment similar to playing in terms of intensity, type of exercise, and the energy system prevailing in the basketball.

1-2 Research Problem:

The athlete's ability to continue performing skills and to withstand fatigue during physical effort requires correct training that is appropriate to the intensity to which the athlete is exposed in tournaments. One of these sports is basketball which requires high physical abilities. After the researcher followed up with the majority of the players in the tournaments held by the Central Federation of Matches, especially the third and fourth periods of the match, which require good endurance, the researcher noticed that symptoms of fatigue quickly appear among the players, This thus influences how tasks are performed, particularly the skill (box out and rebound) for many players. This is what prompted the researcher to use high-intensity interval training (HIIT) to build functional adaptations that suit the intensity to which the basketball player is exposed during the match.

1-3 Goal of the Research:

1- Getting Ready high-intensity interval instruction (HIIT) for young male basketball players.

2- Identifying the impact of HIIT instruction on certain types of special endurance and box out and rebound skills.

1-4 Research Hypothesis:

HIIT Training helps to improve the ability to box out and rebound as well as some specific forms of endurance.

1-5 Limits of Research:

1 - 5 - 1 Human limit: young male Al-Karkh Club basketball players during the 2023-2024 season.

1 - 5 - 2 Time limit: from 1/12/2023 to 1/3/2024.

1 - 5 - 3 Spatial limit: Al-Karkh Sports Club in the Governorate of Baghdad.

Chapter Two: Methods of Research and Field Operations:

2–1 Methods of Research:

The type of approach chosen depends on the nature of the problem to be examined. In this case, the researcher employed the experimental method, creating two equal groups to fit the parameters of the study topic.

2-2 The Research Community and Its Sample:

The Al-Karkh Club, which had eighteen players, defined the research community. With a selection rate of (66%), a sample of twelve players from the research community was chosen at random. With six players in each of the two equal groups (control and experimental), the study sample was split up.

2-2-1 Sample uniformity: Before starting to implement the exercises, the researcher made sure of the homogeneity of the sample, in which there are no fundamental differences that affect the study's findings for the factors examined, given that the sample is same gender and age group and has the same years of training. The sample suffers from the problem investigated and its variables. Therefore, the researcher did not perform statistical procedures to verify that.

2-2-2 Equivalency of the Two Research Groups: As indicated in Table (1), the researcher established equality between the two research groups with regard to the variables being examined.

The equality of the experimental and control groups in the studied tests is displayed in Table (1).

Statistical methods / Test	Measurement unit	Experimental		Control		Calculated (t) value	SIG	Type of significance
		Pre		Pre				
Strength endurance (hopping for one minute)	Degree	8	100.22	7.22	100.12	0.42	**0.076**	**Insignificant**
Speed endurance (running for 40 seconds)	Degree	8.74	163.18	9	165.22	0.88	**0.084**	**Insignificant**
Box out and rebound	Degree	2	12.42	2.11	12	0.98	**0.093**	**Insignificant**
*At free degree (10) and significance level (0.05)								

2-3 Research Methods, Instruments, and Devices:

In order to assist him finish the study processes, the researcher employed the following techniques, instruments, and gadgets:
- Testing and measurement

- Note

- A laptop type (DELL) 1 piece.

- Manual calculator type (Casio) 1 piece.

- Electronic stopwatch type (Diamond) 2 pieces.

- Fabric measuring tape 1 piece.

- Plastic signs 6 pieces.

- Legal basketballs 4 pieces.

- Whistle type (Fox) 2 pieces.

2-4 Determine and Characterize Special Endurance Tests:

To nominate tests that express the measurement of the specific endurance variable (strength endurance, speed endurance, box out and rebound), The investigator carried out an exhaustive examination of

scientific references and references and what is available on the World Wide Web (the internet) specialising in the domains of basketball, sports training, testing, and measuring. The researcher concluded that he used objective and codified tests that had previously been used in many researches and studies, with the same specifications as the sample in the current study, which are:

First: Strength Endurance Test(Walren, Young**,** 1995**,** 89) **:**

1- Continuous hop Find the longest distance you can go in a minute by testing with both feet together.

Purpose of the test: to measure the strength endurance of the muscles of both legs.

Tools and capabilities: Football court.

Test procedure: Continuous stepping with both feet together to mark lines drawn on the ground.

Calculating grades: The greatest distance in meters is recorded in a time of one minute, and the distance travelled is an indicator of strength endurance.

Second: Speed Endurance Test(Hassanein,1995,416):

1- 40-second running test.

The test's goal is to gauge speed endurance.
Location: Basketball court divided from 0 to 28 metres.

Two tools were used: a whistle and a stopwatch.
Performance method: The player begins from a high position with both feet behind the basketball court's finish line. The tester signals that the player is ready, and then the player is instructed to run at maximum speed to the end of the field and then return in the same way to the starting point, and so on back and forth until the end of the period specified in 40 seconds.
Performance conditions: The player must touch the final line with one of his feet while going back and forth.

Recording: The distance the player covers during the specified time is calculated to the nearest meter the player has passed.

Third: Box Out and Rebound Test(Fawzi and Salami, 1986, 403):

The test's objective is to gauge a person's capacity to draw a rebound ball.
Tools and capabilities: Basketball goal, a basket ball, and a stopwatch.

Description of the performance: The player is three meters away from the goal.

with a line drawn on it parallel to the ground and at a height of (3 m). The player throws the ball with two or one hand toward the goal and above this line. Then he advances to grab the rebound ball from the highest point of the goal and returns again to the starting line and repeats the same attempt for one minute.

Recording: Counting the number of attempts in which the ball touches the target above the line drawn on it in the specified time.

2-5 Survey Experiment:

The researcher conducted a survey experiment, which was performed on a sample of five players from the study community on Saturday, September 12, 2024, at four o'clock in the afternoon, in the Al-Karkh Sports Club in the Baghdad Governorate. The purpose was to determine whether the exercises were appropriate for the study population and what challenges the researcher had during the main experiment procedures.

2-6 Pre-tests:

Prior to doing pre-tests on the study sample, the researcher provided instructions on how to conduct the test for the research. The pre-tests were then given to the research sample participants on Wednesday, 13/12/2023, in the Baghdad Governorate's Al-Karkh Sports Club hall.

2-7 Special Exercises Prepared by the Researcher:

1. By placing a ball on the ground in the free-throw circle, a player blocks another player and prevents him from reaching the ball.

2. Throw the ball on the board from 3 or 4 meters, then jump and catch it from the highest point.

3. The same exercise is done by placing a rubber band on the player's belt with the help of a teammate and moving back an appropriate distance creating resistance.

4. Stand under the board, hold the ball, and jump upward by extending the arms and reaching the highest point.

5. With two players, a striker and a defender, standing in front of the basket, and the ball is thrown on the board by the coach, the defender blocks the striker and catches the ball.

6. The same exercise is done by striker moving away from the forbidden area while throwing the ball. The defender moves and blocks the striker.

7. The ball is in the hand of the striker from the free-throw area then he throws. Meanwhile, the defender blocks and picks up the ball from the basket.

8. The same exercise is done by two strikers standing in the free-throw area while throwing. The defenders block and go to catch the ball.

2-8 The Main Experiment (Application of Activities Prepared by the Researcher):

On Saturday, 16/12/2023, when the pre-tests were finished, the researcher gave the experimental group the tasks he had planned for the training unit in the main part exclusively. On Thursday, 15/2/2024, at four o'clock in the afternoon, the special exercises came to a conclusion at the Al-Karkh Sports Club Hall.

- Period: (8) weeks.

- Weekly unit count: three, denoted by (Saturday, Monday, and Wednesday)

- There are twenty-four units of exercises in all.

- The researcher trained repeatedly utilizing the stations approach with high-intensity intervals.

- The duration of the major training unit part is around fifteen to twenty minutes, during which the specific exercises are performed.

- For four groups, the researcher used the eight activities in the unit, giving each group two minutes.

The rest time among the groups was (1 minute), and each exercise had four repetitions with a work time of (30 seconds) and a Thirty seconds were spent in between each repeat. The entire amount of time needed to complete the

exercises was (8 minutes) and the total rest time in the training unit was (7 minutes), noting that rest is positive when using free throw shooting, meaning that the main part of the unit reached (11.5 minutes).

2-9 Post-Tests:

On Saturday, February 17, 2024, the researcher completed the post-tests under the identical set of conditions and circumstances as the pre-tests.

2-10 Statistical Approaches:

The following techniques were extracted by the researcher using the seventeenth version of the Statistical Portfolio for the Social Sciences (SPSS):

Chapter Three: Presentation, Evaluation, and Talking About the Outcomes

3-1 Test results are presented and analyzed for the variables that the experimental research group was looking at.

The arithmetic means, standard deviations, and (t) value for the experimental research group between the pre- and post-tests are displayed in Table (2).

Statistical methods / Test	Measurement unit	Pre-test		Post-test		Calculated (t) value	SIG	Type of significance
Strength endurance (hopping for one minute)	Degree	100.22	8	139	10	12.52	0.000	Significant
Speed endurance (running for 40 seconds)	Degree	163.18	8.74	188	11.22	9.36	0.000	Significant
Box out and rebound	Degree	12.42	2	16.11	3.12	3.62	0.000	Significant
*At free degree (5) and significance level (0.05)								

By reviewing Table (2), we find that the significance level values for all the investigated variables are less than 0.05, and this indicates that HIIT training has achieved a clear effect on the research variables.

3-2 Displaying the Control Research Group's arithmetic means, standard deviations, and T-value, which were computed between the pre- and post-tests.

The arithmetic means, standard deviations, and (t) value computed for the control group between the pre- and post-tests are displayed in Table (3).

Statistical methods / Test	Measurement unit	Pre-test		Post-test		Calculated (t) value	SIG	Type of significance
Strength endurance (hopping for one minute)	Degree	100.12	7.22	105	6.21	4.22	0.000	Significant
Speed endurance (running for 40 seconds)	Degree	165.22	9	167.32	8	2.76	0.000	Significant
Box out and rebound	Degree	12	2.11	13.87	2.55	2.57	0.000	Significant
*At free degree (5) and significance level (0.05)								

By reviewing Table (3), we find that the significance level values for all the investigated variables are less than 0.05, and this indicates that HIIT training has achieved a clear effect on the research variables.

3-3 Presentation, The post-test results for the experimental and control research groups are analyzed and discussed.

For the experimental and control study groups, Table (4) displays the computed (t) value between the post-tests together with the arithmetic means and standard deviations.

Statistical methods Test	Measurement unit	Control		Experimental		Calculated (t) value	SIG	Type of significance
		Pre-test		Post-test				
Strength endurance (hopping for one minute)	Degree	105	6.21	139	10	16.55	0.000	Significant
Speed endurance (running for 40 seconds)	Degree	167.32	8	188	11.22	9.78	0.000	Significant
Box out and rebound	Degree	13.87	2.55	16.11	3.12	3.56	0.000	Significant
*At free degree (5) and significance level (0.05)								

By reviewing Table (4), we find that the significance level values for all the variables investigated are less than 0.05.

3-4 Analysis of the Findings:

As can be seen from Tables (2 and 3), which present and analyze the pre- and post-test results for the experimental and control research groups, there are notable differences between the pre- and post-test results, favoring the post-tests for both groups in the variables examined. As can be seen in Table (4), there are notable differences favoring the experimental research group when comparing the post-test results for the experimental and control research groups. The researcher ascribes this advantage to the particular skill exercises' influence. which were similar to the competition conditions and the exercises in the (HIIT) style, which were applied at different speeds and with little rest time .This was what the researcher sought, as the experimental group's

performance of the exercises is performed with high intensity and short rest periods to achieve the ability to perform the special endurance of strength, speed, and skill researched for basketball players. This is consistent with what (Majeed et al. 2007) mentioned that the ideal way to develop endurance is to do it intensely and quickly. way to develop endurance abilities among the training methods that were used as these exercises lead to maximum oxygen absorption, which is a measure of aerobic fitness and endurance. As for the skill aspect, the development which The study credits this to the player's utilization of "HIIT" workouts in conjunction with rebounding skills, which replicate the performance standards they encounter.

in a real match with high effort, especially in the rebound skill, which requires endurance, strength and speed, especially for box out and rebound.

Chapter Four: Concluding remarks and suggestions:

4-1 In conclusion:

Based on the findings, the investigator came to the following conclusion:
1- Basketball players' ability to create a unique endurance of strength and quickness has been impacted by HIIT training.

2- HIIT, or high-intensity interval exercise, raised the box out and rebound levels.

4-2 Suggestions:

Considering the researcher's findings, he suggests doing the following:
1- High-intensity workouts are essential for basketball preparation because all age groups, while taking into account the training conditions, because of their great importance in creating great adaptations for the players.

2- Conduct similar research in other methods and skills.

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