



## **The effect of high-intensity interval training (HIIT) on the special endurance and some offensive skills of handball players**

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### **Abstract**

The importance of the research emerged in using a type of modern methods as an attempt to improve performance and develop special endurance. A set of exercises in the HIIT style was developed as a comprehensive and intensive training program in a scientifically studied manner that can enhance and develop special endurance and various offensive skills for female handball players. These qualities contribute greatly to increasing endurance and improving their offensive performance on the field. The research aimed to prepare exercises according to the high-intensity interval training (HIIT) method in developing special endurance and offensive skills for female handball players. The researchers adopted the experimental research method by designing a single group with tight control in the pre- and post-tests. The research community was represented by the players of the Al-Talaba Sports Club, numbering (10) players who continue training. They were chosen intentionally. The training program was implemented on Sunday (10/3/2024) until (10/6/2024). The duration of the training program was (12) weeks, with three training units per week, and the total number of training units was (36) training units. The training days were Saturday, Monday and Wednesday. The training unit time (120) minutes, and the time of the main part of the training unit was (80) minutes, and the intensity used ranged from (85 - 95%), from the first training unit to the last training unit, and the total repetitions ranged from (3-10) and the groups (3-4) within the training unit, and these exercises are characterized by the presence of an intermediate rest between the exercises in the form of positive rest (jogging or stretching exercises), and the pre-tests were conducted on the research sample on (Saturday and Sunday)

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corresponding to (10-9/3/2024) at 3 pm and the experiment was completed by applying the post-tests on Wednesday and Thursday (12-13/6/2024) and the researchers used the statistical package SPSS version (26) to calculate the values of the arithmetic mean, standard deviation, skewness coefficient, percentage and t-test, and the researchers concluded that the interval training (HIIT) had a positive effect in developing the special endurance, which was reflected in developing the performance of the players in the research sample, and the researchers recommend using High-intensity interval training (HIIT) method in developing physical abilities and offensive skills of female handball players.

**Keywords:** Interval training HIIT, endurance, offensive skills, handball.

## Introduction

Longer training) HIIT (It is one of the modern methods of training that simulates the style of attack and defense skills in handball in terms of using high-intensity periods during the match accompanied by periods of low intensity and for a short period .Confirms 2014) Schmid ( Anaerobic interval training (HIIT) is more convenient, because it makes workouts more challenging and effective .As it is considered) HIIT (Excellent style To regulate cardiorespiratory training, which involves performing repeated bouts of short bouts of exercise, which include times of high-intensity exercise interspersed with periods of low-intensity. Known as Mark Jones (Mark Jones.2014 ,p52)"

Amr Farag (2012) adds“ ,Success in the training process depends on the extent to which the coach is able to take into account the specifications of the training sample from all internal and external aspects, envision the experimental conditions, and use special means and methods to achieve the goals set for the stages of sports preparation, which achieves a balance between the various aspects of the individual and the nature of the sports activity that is being planned on the other hand”.(Amr Bassiouni Farag: 2012).

The researchers used the high-intensity interval training method) HIIT (Which has a role in developing personal endurance, and this matter positively affects the performance of skills in the required form and with high efficiency throughout the match without decreasing the level of performance of the players. Also, the most important feature of this method is its economy of time , “as the air breaks provide a safe and comfortable way to withdraw from rest-8) ”.p195 .Moran T. G & Meglynn)

This is what she indicated studies) Martin Jabala (Professor of HIIT exercise physiology at McMaster University in Canada ,His studies have proven that the training benefits that we can reap from a full hour of aerobic exercise, we can reap in several minutes of high-intensity interval exercises) .HIIT .(Many studies have confirmed that the faster and more difficult the exercise during exercise periods, the more effective it is and the shorter the duration it takes .(Martin Gbala, 2017)"

The importance of research has emerged Using a type of modern methods in an attempt to improve performance and develop special endurance Develop a set of HIIT-style exercises as a comprehensive and intense training program In a scientifically studied manner It can enhance and develop the special endurance and various offensive skills of female handball players, and these qualities contribute greatly to increasing their endurance and improving their attacking performance on the field. The problem of the research was that the development of physical and skill performance depends in particular on special endurance in executing skills, which is one of the things that Female handball players need it in the match, and in order for the players to reach the higher levels, those interested in the field of sports training tend to look for the use of modern training methods and approaches to develop endurance and skill performance, as it is the basis and an important pillar, as it is one of the basic conditions for maintaining consistency and stability of performance throughout the duration of the match, and physical performance is one of the basic requirements for deciding the outcome of the matches, (Kadhim & Mousa, 2024) and because the researchers are interested in this activity and through following it and watching many handball matches, the researchers noticed that there is a clear weakness in the endurance of skill performance and this appears clearly in the minutes. The last part of the match, where signs of loss of concentration and accuracy appear, and this does not enable the players to perform the role required of them in implementing the tactical plans and duties drawn up on the field. Given the great importance of endurance and skill performance in deciding the results of the matches, and for the purpose of determining the level of skill performance of the players, the researcher therefore decided to study this problem. The aim of the research is to Identify the effect of exercises prepared according to the high-intensity interval training method) HIIT (In developing special endurance and some skills for female handball players .The researchers assumed There are statistically significant differences between the results of the pre- and post-tests of the research sample in developing special endurance and some offensive skills among female handball players, in favor of the post-test.

**Research areas:-**

**Human domain :**Girls Sports Club players.

**Temporal domain.**(2024\6 \13 -2024\3\2) - :

**Spatial domain - :**Sports activity hall in Ziona for the Student Sports Club.

**Method and procedures:**

The researchers adopted the experimental research method by designing one group with tight control in the pre- and post-tests. The research population and sample were represented by the girls 'sports club players, numbering (10) players continuing to train, chosen intentionally.

**Choose search tests**

The researchers deliberately chose the research tests through their experience in this field and by relying on Arab and foreign sources in determining the physical and skill tests that are compatible with the nature of the research, as follows:

- 40 :1second running test):Muhammad Subhi Hassanein, p. 169(
- :2Sit-and-jump test for (90) seconds) :Thamer Mohsen and others 114(
- :3Test of bending and extending the arms from the forward leaning position for (30 seconds) ,
- )Muhammad Subhi Hassanein, p. 236.(
- :4Strength bearing of the abdominal muscles) :Muhammad Hassan Allawi and Muhammad Nasr al-Din Radwan, p. 137(
- Skill tests) :Diaa Al-Khayyat and Nofal Muhammad Al-Hayali, p. 494.(
- 1Handling and receiving speed test (measuring the speed and accuracy of passing)
- 2Plump test.
- 3Scoring test (to measure the high jump shooting test)

Exploratory experience:

The researchers conducted the first exploratory experiment on Saturday, March 2, 2024, for female students 'sports club players, on a survey sample of (5) female players from within the research community.

The aim of this experiment was to know the difficulties facing the researchers and work to overcome them, to know the time taken and the willingness of the players to conduct the tests, to overcome errors in the tests, to ensure the validity of the tests and their suitability to the research sample, to verify the scientific foundations of the tests, as well as to organize and cooperate among the members of the assistant work team.(Kadhim, 2024)

The researchers also conducted a second exploratory exercise experiment) HIIT (On Tuesday 3/6/2024 in the Student Club for the same female athletes, to determine the difficulty and suitability of the interval exercises for the sample, knowing the duration of work, the number of repetitions and sets, and the rest periods between them, as well as determining the resulting pulse for each exercise to determine the required intensity, ensuring the safety of the tools and devices used in the research, and verifying the execution time of the exercises within the main section.(Kadhim, 2024)

Apply exercises using high-intensity interval training HIIT

Starting to implement the training units for the research sample, taking advantage of modern scientific sources and their experience in this field, to prepare exercises in the interval training style that were included in the main section of the training units. The method of applying the exercises within the training units was in the method of high-intensity interval training, and the implementation of the training program began on Sunday (3/10/2024) until (6/10/2024). The duration of the training program is (12) weeks, with three training units per week and the number of training units. The college had (36) training units, and the training days were Saturday,

Monday, and Wednesday. The time of the training unit was (120) minutes, and the time of the main part of the training unit was (80) minutes .

The intensity used ranged (85-95%) from the first training unit to the last training unit, and the total repetitions ranged from (3-10) and groups (3-4) within the training unit. These exercises are characterized by the presence of an inter-rest between the exercises in the form of positive rest (jogging or stretching exercises).

The pre-tests were conducted on the research sample on (Saturday and Sunday) corresponding to (10-9/3/2024) at 3 pm in the student sports club hall, and the experiment was completed by applying the post-tests on Wednesday and Thursday.(2024/6/13-12)

The researchers also used the SPSS statistical package, version (26), to calculate the values of the arithmetic mean, standard deviation, skewness coefficient, percentage, and t-test.

Search results:

After the researchers finished conducting pre- and post-tests on the research sample and processing the results statistically to reach the research objectives and verify the hypotheses formulated therein.

Table (1) shows the results of the pre- and post-physical tests for the research variables

Tests	Pretest		Posttest		F	F E	T Calculate d	value themselve s	level Connotatio n
	Q	$\frac{+}{A}$	Q	$\frac{+}{A}$					
Bearing speed	125.70	2.33	126.4	2.31	9.700-	0.650	-14.908	0.000	Dal
Carrying strength for the legs	13.90	1.197	18.30	1.33	4.400-	0.339	-12.944	0.000	Dal
Provides strength to the arms	16.40	1.505	21.10	1.79	4.700-	0.366	-12.818	0.000	Dal
Provides strength to the abdominal muscles	30.30	1.49	39.50	1.08	9.200-	0.442	-20.804	0.000	Dal

Significant: (Sig) (0.05) < at a significance level of (0.05) and degree of freedom (n) - 1.(9) =

Table (2) shows the results of the pre- and post-attack skills tests

Tests	Pretest		Posttest		F	F E	T Calculated	value themselves	level Connotation
	Q	- + A	Q	+ A					
Handling test	12.70	1.49	15.40	1.26	-2.70	0.335	-8.060	0.000	Dal
Plump test	24.90	0.73	20.80	1.31	4.10	0.388	8.128	0.000	Dal
Scoring test	4.70	1.15	7.50	1.08	-2.80	0.504	-7.203	0.000	Dal

By reviewing the results of the pre- and post-test physical tests in Table (1), it is clear that there are clear significant differences in all tests and in favor of the post-test. The researchers attribute that the reason for the appearance of the significant differences in the post-tests is the training curriculum prepared by the researchers and the diverse and new exercises that this curriculum contains for the research sample, as it effectively contributed to the development of physical abilities as well as the organized and continuous application in implementing these exercises.

The researchers also relied on the scientific foundations studied for the measured loads (intensity, volume, and density) to suit the level of the female athletes so that comfort was positive between repetitions, as well as the use of appropriate training tools and tools that contributed to raising the endurance and speed of the female athletes.

As mentioned)" Kamal Abdel Hamid and Mohamed Sobhi HassaneinEmploying these exercises using the same common muscle groups in motor performance, as specific endurance is an independent factor from general endurance, indicating that specific endurance is a physical ability that depends on the strength of the muscles and the efficiency of the connection between them and the nervous system, while general endurance depends mainly on the efficiency of the circulatory and respiratory systems in transporting oxygen and nutrients necessary for the continuation of muscle work and the speed of disposal of metabolic wastes (Kamal Abdel Hamid and Muhammad Sobhi Hassanein, p. 71, 1997).

The researchers believe that high-intensity interval training has a direct impact on increasing the development of endurance, because the high-intensity training method helps increase endurance,



as it trains the heart to pump more blood to the working muscles and trains the muscles to extract oxygen from it more efficiently, which makes dealing with all other exercises easier, thus increasing the endurance to perform optimally throughout the match.

As can be seen from Table 2, there is a clear development in the results of the tests (pre- and post-tests) of the skills, in favor of the post-tests. The researchers attribute the reason for the development in the post-tests at the expense of the pre-tests to the positive impact of the training curriculum prepared by the researchers, (Moayd et al., 2019) which includes special exercises that were prepared on scientific foundations and studied in a way that suits the capabilities of the research sample, which had a clear impact on the development of the skills of the research sample. The use of exercises in the high-intensity interval training (HIIT) method and the provision of appropriate training supplies and tools helped in an effective way to increase the extent of the difficulty and complexity of the exercises within the training unit and try to make them as similar as possible to the situations and conditions in which the female players are present during the match. The researchers believe that the variables in the selected training loads were largely compatible with the skill variables and had a positive impact on improving the level of skill performance. This is what Nagham Hatem and Schmidt pointed out, stating that the distribution of time for training practice is one of the important and basic factors that help raise the level of performance using high-intensity intermittent training that the learner performs continuously and consistently with a short period of rest to perform the required skill. This means that the player performs the training in A specific time and increasing the number of training attempts (Nagham Hatem: 215.16)

#### Conclusions and recommendations:

- 1-The interval exercises (HIIT) prepared by the researchers had an effective effect in developing the special endurance of female handball players.
- 2-The interval exercises (HIIT) prepared by the researchers had an effective impact in developing the offensive skills of female handball players.
- 3-The researchers recommend using the high-intensity interval training (HIIT) method to develop the physical and skill capabilities of female handball players.
- 1-The researchers recommend that the exercises prepared in this study be adopted by handball coaches, due to their positive impact on developing the physical abilities and offensive skills of handball players.
- 2- The researchers recommend the need to diversify the use of auxiliary training tools and methods by coaches in the training process because of their positive impact on developing and developing the players 'physical and skill abilities.
- 3- The researcher recommends using high-intensity interval training for different age groups and sports.

Using interval training on female athletes and in other sports.

attached(13)

Exercises used in research

Speed endurance exercises

Exercise number	Description of the exercise	Illustration
A1	Shuttle running around (4) signs (5pm - 10pm - 15pm - 20pm) Where he goes to the first marker and returns to the starting line, then he goes to the second marker and also returns to the starting line, and so on. Thus, the player has covered a distance of 100 metres.	20pm 15pm 10pm 5pm
2A	The player stands and the teammate ties him with a rubber rope from the waist area. When the whistle is heard, the player runs to the middle of the basketball court and returns to the starting point.	
3A	(Standing, dhamma) Jumping sideways with both feet inside circles on the ground, taking into account speed in performance.	2 1



4A	The player jumps up and forward over (6) blocks, with a height of (40cm), where the distance between one block and another is (2m), pulling the knees up and taking into account speed in performance.	2  1  2m  40cm
5A	Running in place and upon hearing the signal, the player runs to the end of the field and then returns to the starting point.	
A 6	The player stands with one of his feet on a platform, and when he hears the whistle, the player jumps alternately with his right and left feet.	
7A	Exercise hopscotch on one leg to the middle of the court, then hopscotch on the other leg to the end of the court.	
8A	Run three laps around the field at full speed.	2

9A	The athlete jumps sideways from a 30cm height to the other side, then jumps to the other side, and so on, while pulling the knees up.	30cm
10A	Use a rope to perform various jumps continuously.	

#### Strength exercises for the legs

Exercise number	Description of the exercise	Illustration
1B	The player stands facing the box at a height of (40 cm). When he hears the signal, the player jumps high with both feet over the terrace before landing, taking into account speed in performance.	40cm
3B	The same exercise as the previous one, but the player holds a medicine ball and a pole (3 kg).	40cm
4B	Steps exercise: The player jumps with both feet from one step to the other, up to (10) steps, emphasizing pulling the knees toward the chest and opening the legs shoulder-width apart. Jumping from one step to another is according to the whistle.	

B5	The same exercise as the previous one, but the player holds a weight ball (2 kg).	
6B	(Full body weight dip) exercise, where an athlete bends and extends the knees for 60 seconds, taking care that the thigh muscles touch the leg muscles.	2  1
7B	The same exercise as the previous one, but the player holds a medicine ball weighing 3 kg.	2  1  3kg
8B	Partridge moves one leg to the middle of the court and then returns on the other leg to the starting position .	Starting line   Midfield   Finish line

9B	The same exercise as the previous one, but the player holds a medicine ball weighing (3 kg).	
10B	The player jumps sideways with his feet together over (6) medicine balls back and forth. The last ball, the player receives the handball from a teammate and performs the scoring.	2  1

#### Strength exercises for the arms

Exercise number	Description of the exercise	Illustration
1C	From the forward lean position, the athlete bends and extends the arms for 60 seconds.	1  2
2C	The player stands and holds the ball with his arms, then throws the medicine ball weighing 2 kg over the head after swinging the ball with maximum force to the teammate. The teammate does the same and returns it to the player.	2kg  4meters  2kg

C 3	The same exercise as before, but the weight of the ball is (3 kg).	4meters  3kg  3kg
4C	The player rests his hands on the ground and the tips of his toes are on the platform. When the whistle is heard, the player bends and extends his arms.	1  2
5C	The player leans back on the bench, and when he hears the whistle, the player quickly bends and extends the arms, emphasizing the full bending and extending.	2  1
6C	(Standing open) Throw a medicine ball weighing 1 kg upward with maximum force with both arms and pick it up.	1  2  2kg

7C	The same exercise as before, but with weight Ball (3 kg).	3kg 1 2
8C	From a lying position on the bench tilted upward, an athlete, while holding a dumbbell weighing 20 kg, bends and extends the arms.	1 2
C9	Forward support exercise (Shnow) with a medicine ball weighing (2 kg), where the player leans on the ball in one arm, and when he bends and extends, he pushes the ball to the other arm for a period of (60 seconds).	2kg 2kg 2 1
10C	From a standing position, the player pushes a medicine ball weighing 3 kg.	3kg 6pm



		4m
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#### Strength exercises for the abdominal muscles

Exercise number	Description of the exercise	Illustration
1D	Exercise (leg raises): The player lies on his back, then raises the legs together, then lowers them for 45 seconds.	
2D	From a lying position on the ground and with the legs stabilized by a partner, the player bends and extends the torso up and down for 30 seconds, taking into account the speed.	
3D	The same exercise as before, but the player bends once to the right side and once to the left.	
4D	Plank exercise: The player leans on the forearms in a position similar to a forward lean and remains in this position for 60 seconds.	

5D	Side plank exercise: From the side lying position, the athlete rests on one arm and the arm is bent at a 90 degree angle for 60 seconds.	
6D	From a lying position on the back, the athlete raises the legs diagonally and holds this position for 50 seconds.	
7D	Alternating legs exercise from the lying position, where the player raises one leg alternately with the other leg for 50 seconds.	
8D	From a sitting position on the chair, the player bends and extends the legs for 40 seconds.	
9D	Exercise (sides with dumbbells) from a standing position. The athlete holds a dumbbell (15 kg) in his right hand. Then the athlete lowers and raises the dumbbells for 30 seconds, and does the same with the left hand.	
10D	Exercise (sides with the medicine ball): From a sitting position on the floor, the player rotates the ball from right to left and vice versa for 30 seconds.	

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