

The Effect of Combined High-Intensity Interval Training Exercises on Some of the Technical Skills and Endurance of Performance for Advanced Futsal Players

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Abstract

The importance of the research lies in scientifically preparing a complex of high-intensity interval training, as researchers believe that it affects some technical skills that are directly involved to endurance the performance of futsal players. As for the research problem: Through the experience of field researchers, they noticed that there is a noticeable decrease in the performance of skills in the second half and in the matches in which the level of technical performance is very high, and this decrease leads to slow movement to take the right place during the performance of those skills, the researchers believe that the reason for this is that these skills do not receive their adequate share of training in a manner consistent with the nature of their performance from the physical and physiological standpoint. The aim of which is to have a positive effect on some of the technical skills and performance of futsal players. The researchers used the experimental method to solve the research problem, and on the research community, the research community was identified with the 14 players of Naft Al Wasat club in the futsal season 2020-2021, they were distributed into two groups equally in a random way (lottery method), and then data was processed using appropriate statistical methods.

Keywords: *high-intensity, skills, performance, interval training exercises*

Introduction

There is no doubt that scientific research has become one of the most important necessities in our modern society in reaching the highest levels for all aspects of life by recognizing the various abilities and energies that God has gifted to man in an attempt to achieve the greatest possible benefit from scientific theories ¹ and their application to serve and develop society, including the sports field and, many sporting events may require a great deal of time to reach the high level of capabilities. One of the games that has gained great attention in recent times is the futsal game, which is one of the most popular games in the world, and the futsal game requires a great muscle capacity to perform its skills, and upon looking into the nature of performance, we find that it requires ² high energy to perform the motor duty strongly and speed and endurance, as it requires the players, when performing their skills, high physical capabilities. And enduring the defensive performance

of the futsal game requires a high level of physical and skill performance in a consistent manner, as defending the stadium and its various forms, as well as offensive skills are characterized by the difficulty of their rapid and surprising skill performance, so it is important that physical abilities and skill performance serve one of them, the other is to achieve the goal, and the level of the player's ability can be determined through these variables.

So, through the researchers' field experience, they identified the problem of their research, and they noticed that there is a noticeable decrease in the performance of skills in the second half and in matches where the level of technical performance is very high, and this decrease leads to slow movement to take the right place while performing those skills, the researchers believe that the reason for this is that these skills do not take their sufficient share of training in accordance with the nature of their performance in terms of physical and

physiological, so the researchers decided to go into this experiment by preparing complex exercises and the aim of it is to have a positive effect on some technical skills and the performance of the players futsal³.

Thus, the importance of research is evident in preparing complex exercises, the aim of which is to have a positive effect on some of the technical skills and performance of futsal players, as this training method improves the player's physical ability and skill, so researchers wanted to go into this experiment. Consequently, the researchers set the objectives of the research to prepare complex exercises using the method of high-intensity interval training in futsal, as well as to identify the effect of combined exercises using the method of high-intensity interval training on some technical skills and the performance endurance of futsal players. Likewise, they hypothesized that there is an effect of combined high-intensity interval training exercises on some technical skills and endurance performance of futsal players. As for the fields of research, they were represented by the futsal players of the Naft Al Wasat Sports Club for the 2020-2021 sports season, and the time for the experiment was on from 5/11/2020 until 14/2/2021, as for the place of conducting the field exercises and experiments, they chose the researchers The closed sports hall of the Kufa Sports Club.

Research methodology and field procedures:

Research Methodology

The approach is one of the important factors that the researcher follows to solve his problem, and it is chosen according to the nature of the problem to be studied, as the nature of the problem necessitates researchers to use the experimental method because it is consistent with the nature of the research problem, and by designing the method of the two equivalent groups (experimental and control) with the pre and post- tests.

Community and sample research:

The research community was identified with the futsal players of Naft Al Wasat Sports Club for the 2020-2021 sports season and the researcher selected them entirely for the experiment, and they were distributed into two groups equally by random method, and then the experimental group underwent training that includes the

use of compound exercises in a manner high-intensity interval training while the control group remained using the trainer's standard training approach.

Devices, tools and means used in the research:

Means of data collection:

- Arab and foreign sources and the internet.
- Personal interviews.
- Tests and measurements.
- Special forms for recording test results for players.

Tools and devices used:

- Football field halls.
- Ballroom footballs number (14) type (Molten).
- Blackboard, chair.
- floors and barriers of different heights (70,60,50,40,30) cm, count (10).
- A Chinese electronic device for measuring height and weight.
- A floor ladder with a length of (4,6 m) count (4).
- Rings with a diameter of (60, 50, 80) cm, count (14).
- (2) whistle type (FOX).
- (3) Casio sports stopwatch.
- Office tools (papers and pens).
- A Chinese electronic device for measuring height and weight.
- A leather tape measure.
- Colorful adhesive tape.
- Dyes (spray).
- A wooden box of dimensions (1 x 1 m) to define the scoring and damping areas.
- Ball launcher device.

- A legal (football halls) goal (2 × 3) m.
- Flex material placed on the target, three overlapping rectangles are drawn on it: -
 - The large rectangle (2 x 3) cm.
 - The middle rectangle is (160 x 240) cm.
 - Small rectangle (120 x 180) cm.
- A specific area for damping its dimensions (1 x 1) m.
- A specific area for scoring (1 x 1) m count (3).
- Digital camera .

Field research procedures:

Determine search variables:

Test (Put down - Dribbling - Scoring):

- **Test name:** Put down, then running with the ball (dribbling) in different directions and scoring.
- **Purpose of the test:** To measure the velocity and accuracy of put down, dribbling and scoring.
- **Used Tools:**
 - 1- Soccer halls, size (4), count (3).
 - 2- A leather tape measure.
 - 3- Colorful adhesive tape.
 - 4- Whistle Number (1).
 - 5- Dirt pigments (spray) type.
 - 6- Wooden box dimensions (1 x 1 m) to define scoring and put down areas.
 - 7- Ball ejector device.
 - 8- Goal (soccer halls) legal (2 × 3) m.
 - 9- Flex material placed on the target, on which are drawn three overlapping rectangles, their dimensions: -
 - The large rectangle (2 x 3) cm.
 - The middle rectangle is (160 x 240) cm.
 - Small rectangle (120 x 180) cm.

- 1- A specific area for suppression whose dimensions are (1 x 1) m.
- 2- A specific area for scoring (1 x 1) m, count (3).
- 3- Digital camera.
- Performance description:

The player stands behind the line of the specified put down area, which is away from the ejector device (8) m (the location of the ejector device is in the opposite direction to the target), and after giving the start signal, the ejector device (the ball is ground crawling) throws the direction of the put down area, the player advances into the damping zone, trying to stop the movement of the ball (put down) by means of mute the ball under the foot (Sole) with changing the direction to run the ball (dribbling) by pulling the ball under the foot (Sole) until it reaches the scoring area (1), in order to aim towards the areas indicated in the target (the overlapping rectangles) according to their importance and difficulty, all players perform the first attempt in a row and then move to perform the second attempt for all testers through suppression, then rolling towards the scoring area (2) and then moving to perform the third attempt from the scoring area (3) in the same way in the first and second attempts.

- o The scoring zone (2) is in the middle of the suppression zone and the target, and is (6) m away from the suppression zone and (9) m from the target.

- o The scoring area (1) is to the right of the scoring area (2) and away from it (3) m.

- o The scoring area (3) is to the left of the scoring area (2) and is (3) m away from it.

- Performance conditions:

- o The ball movement must be stopped within the area designated for put down.

- o The ball must be stopped in a way that suppresses the ball under the foot (Sole).

- o The test begins by damping the ball and changing the direction by rolling the ball towards the scoring areas (1-2-3) according to the sequence, then scoring towards (the overlapping rectangles).

- o The player must perform the roll by pulling the ball at the bottom of the foot (sole).
- o If the ball goes out of the player's control while rolling, the tester is given a zero score.
- o Scoring must be played from the designated areas for scoring.
- o The player must take the test as soon as possible.
- Register method:
- o The player is given (three) attempts.
- o A player is awarded a score of 1 for successful suppression.
- o A player is calculated (zero) scores for failed put down .
- o A player is awarded (one score) for a successful roll.
- o A player will be charged a zero score if the ball goes out of the player's control while rolling
- o A player (four degrees) is awarded if the ball hits field No. (4).
- o A player (three degrees) will be counted if the ball hits field No. (3).
- o A player will be counted (two degrees) if the ball hits field No. (2).
- o A player is counted (one degree) if the ball touches the outer parts of the goal, including the post and the crossbar.
- o A player is scored (zero) if the ball comes outside the boundaries of the goal (overlapping rectangles).
- o In terms of accuracy, the upper limit of accuracy degrees is (18) degrees (3) for put down, (3) for rolling, and (12) for scoring.
- o In terms of time, it is extracted from the digital camera film through the (kinovia) program placed on the computer, where it is calculated at (1/1000) of a second.
- o Measurement unit (degree / second).

- **Notice:** The time for the test is calculated by adding the times of the three attempts, and the time of each attempt is calculated from the moment the laboratory puts out the ball through the skill of rolling to the moment the ball reaches the goal (overlapping rectangles). Then the total scores (accuracy degrees) are calculated divided into the total time through the law (FTSE) Rate) which states: -

$$(\text{Skillful performance}) = \frac{(\text{Total Accuracy Score})}{(\text{Total time})}$$

Futsal football endurance test:⁽¹⁾

- **The objective of the test:** to measure the endurance of futsal performance.

- **Used equipment's :**

- 1- Futsal football field.
- 2- Balls.
- 3- Signs.
- 4- Stopwatch.
- 5- Whistle.
- 6- Printed 2x3 poster.
- 7- Colorful adhesive tape.
- 8- Registration form.

- **Test Description :** The player stands at the starting point of the position and upon hearing the starting signal, she rolls the ball No. 1 and passes between the two figures in the midfield circle, as the distance between the two characters is (1.5 meters) and continues to run with the ball until it reaches the line at a distance of (7 meters), the player passes the ball to area No. (1) between the signs and runs towards the ball No (2), as he runs with the ball rolling and passes between the signs in the middle circle and continues running until he reaches a line located at a distance of (10 m) from the goal line, then the player scores the ball to area No. 1 drawn on a poster inside the goal and then returns to take ball No. (3) and (4) to ball No. (16) where he passes (8) balls and aims (8) balls, noting that passing and scoring is according to the sequence.

- **Performance conditions:** If a player hits the correct sequence, she gets a score, and if she misses she gets a zero

- **The method of registration counts the player's time + accuracy:**

- 1- Calculates the time of the entire situation.
- 2- Calculates the accuracy of passing and scoring a position.
- 3- The score registered by the player is divided into the total score, to show us (the performance success rate).
- 4- Subtracted (the performance success rate) from the correct one to give us the failure rate for performance accuracy.
- 5- The failure rate for accuracy of performance is multiplied by the overall situation time to yield a fraction of the performance time.
- 6- The result of point (5) is added as a reward for the lack of quality performance to the overall situation time to produce our final unit of measure for bearing performance.

Exploratory experience:

The exploratory experiment was conducted before starting the basic experiment in order to know the most important obstacles and negatives in order to be addressed, and the aim of the exploratory experiment is: -

- 1- Knowing the suitability of the tests for the research sample and measuring their performance time.
- 2- Ensure the suitability of the field and the tools used and their suitability for the tests.
- 3- Preparing the support work team, as well as identifying the difficulties they may encounter.
- 4- Knowing the suitability and possibility of applying the combined exercises using the method of high-intensity interval training for the members of the research sample.
- 5- Knowing the difficulties that may face the

course of work and developing the most appropriate solutions for them.

The main experience:

Pre-tests:

After completing the exploratory experiment and making sure of it, the researchers applied the main experiment by applying the tests to the research community, and the pre-tests were conducted on Monday 2/11/2020, as the tests were in the following sequence:

Futsal technical skills tests:

Futsal endurance test:

Preparing and implementing complex exercises using the high-intensity interval training method:

The researchers prepared and organized the compound exercises using the method of high-intensity interval training, depending on the personal experience of the researchers, It was applied to the experimental group on Saturday 7/11/2020 until 5/1/2021, taking into account (intensity, repetitions, appropriate rest periods) and researchers codified these exercises on a scientific basis, as well as the physical and functional capacity of the research sample, the tools used and the training method, so that these exercises are able to develop technical skills and withstand performance in futsal, and to achieve the objectives and goals of the training process.

Details of functional exercises in the training curriculum: -

- The total number of training units that included complex exercises in the high-intensity interval training method (24) units, and the number of weekly training units that applied functional exercises (3) units for a period of (8) weeks.
- The time for compound exercises in the method of high-intensity interval training in one training unit (30-35) minutes.
- The objective of combined high-intensity interval training exercises is to develop the technical skills under study and to endure performance in futsal.
- Training days are (Saturday, Monday and

Wednesday).

- Observing the exchange of action between muscle groups.

- Planning formations of compound exercises in the style of high-intensity interval training during the weekly and daily units are (1-2).

Post-test:

The researchers, with the help of the assistant work staff, conducted the post-tests for the research sample after completing the application of the combined exercises using the method of high-intensity interval training, and that was on Saturday 9/1/2021 and with the same sequence of pre-tests, the researchers took into account the same conditions in which the pre-tests were conducted in terms of the sequence of tests.

The statistical methods used:

- Mean.
- Median.
- Std. Deviation.
- Skew ness.
- (T) test for cross-linked samples..
- (T) test for independent samples.

Presentation, analysis and discussion of results:

Presenting and discussing the results of the pre and post tests for the control and experimental groups for the variables under discussion:

Displaying the results of the pre and post tests for the control group for the searched variables:

Table (1) shows the arithmetic mean, standard deviations, the calculated value (t) for the correlated samples, and the level of test significance, the significance of the teams for the pre and post- tests of the control group for the studied variables.

Variables	Measuring unit	Pre- test		Post-test		Value (T) Calculated	Level sig	Type sig
		Mean	Std. Deviation.	Mean	Std. Deviation.			
Put down, Dribbling, Scoring	Second/ degree	0.549	0.028	0.745	0.049	10.764	0.000	Sig
futsal endurance performance	Second	164	11.82	154.6	7.22	2.319	0.023	Non sig

Presenting the results of the pre and post tests for the experimental group of the studied variables:

Table (2) shows the mean, standard deviations, the calculated value (t) for the correlated samples, and the level of test significance, the significance of the teams for the pre and post- tests of the experimental group of the studied variables.

Variables	Measuring unit	Pre- test		Post-test		Value (T) Calculated	Level sig	Type sig
		Mean	Std. Deviation.	Mean	Std. Deviation.			
Put down, Dribbling, Scoring	Second/ degree	0.551	0.023	0.908	0.023	36.5	0.000	Sig
futsal endurance performance	Second	164.56	7.55	146.81	6.22	13.987	0.000	Sig

Presentation of the results of the tests (post-test) for the control and experimental groups of the searched variables:

Table (3) shows the value of (T) calculated for the independent samples, the level of test significance, and the significant differences between the test results (post-post) for the control and experimental groups of the investigated variables.

Variables	Measuring unit	Control		Experimental		Value (T) Calculated	Level sig	Type sig
		Mean	Std. Deviation.	Mean	Std. Deviation.			
Put down, Dribbling, Scoring	Second/ degree	8.021	0.35	8.586	0.221	7.137	0.000	Sig
futsal endurance performance	Second	154.6	7.22	146.81	6.22	4.960	0.001	Sig

Discuss the Results

The results presented in tables (1) and (2) for testing the technical skills discussed showed that there are significant differences between the pre and post tests and in favor of the post tests for the control and experimental groups, the researchers attribute the reason for this moral difference to the members of the control group due to the exercises that were applied with methods and methods prepared by the coach in his training units, as they caused the development of those skills that are among the most important pillars of the futsal game, which enables the team to perform offensive and defensive plans well, which led to the presence of significant differences in favor of the post-tests, as for the significant differences those skills that appeared in the tables above for those skills, as well as the endurance of soccer ball performance for the members of the experimental group, the researchers see as a result of their use of combined exercises in the method of high-intensity interval training, the philosophy and the nature of compound exercises is the use of movements within the three directions and surfaces of movement (lateral or sagittal, front, and lateral), it is the nature of all the movements of the human body in life and sports in general and the skills of the futsal game in particular in working on these three surfaces, and thus working collectively with respect to the muscles of the body during complex exercises with high compatibility between them, and

its reflection on the increase and development of the researched skills as well as endurance performance, this is what was found in compound exercises designed by researchers using the high-intensity interval training method and applied to the members of the experimental group, as training according to the high-intensity interval method coordinates the work of the muscles together to produce the optimum energy for the motor work, it will be the fastest and most powerful way to obtain muscle development and its abilities at all levels, as it improves force production and protects joints from injury ⁽¹⁾, if it is performed at specific and varied times in terms of exercises, it is very similar to playing situations and is similar to the new amendments in the law of the game, which is characterized by high speed and change from defense to attack, and that the method of high-intensity interval training helps the player to acquire new fitness makes you do a set of exercises sports in less time, but double the effort ⁽²⁾.

Also, the use of anaerobic exercises to withstand performance was within scientific foundations in terms of rationing the intensity of exercise, as well as rest periods between repetitions and groups, which enables the player to perform other repetitions with almost the same efficiency and speed, in addition, organized and continuous training gives positive results in developing the goal of training, and this is what (Bastwissi Ahmed) emphasized, "The need to develop endurance in the

early years of training youngsters in various games, including futsal football, as it is a physiological ability that needs a long time to develop in order to delay the phenomenon of fatigue, that negatively affect the form of motor performance⁽³⁾, the researchers also attribute the reason for this development to the nature of the exercises used in their training program, as these exercises focused directly on skill performance and endurance and how to perform at every moment of the match time with the same efficiency and high capacity for skilled performance, as the standardization of the intensity, size and intensity of training loads in the training units for developing performance endurance to shed a training burden affecting muscles and vital organs, including the performance of players under the influence of an appropriate level of fatigue, which is necessary for the development of special endurance⁽⁴⁾.

As for the results presented in table (3), which show the preference of the differences in favor of the experimental group in the post-tests, the researchers believe that the reason for the emergence of the moral differences is due to the combined exercises in the high-intensity interval training method that they prepared as it focused on using large areas of the playing field, which provides a great opportunity to continue performance for a longer period and in line with the method of developing these skills as well as endurance performance, and the other reason is the nature of these exercises used in the training process, which is based on scientific foundations in terms of intensity, number of repetitions and rest periods, as well as determining the distances used in preparing these exercises and the degree of similarity to a large extent, the actual playing conditions, including the physical, skill and plans that these exercises contain in terms of the development of these variables, this is what (Salman Ali Hassan) confirmed, "The training process is a constructive process that works to develop and develop physical capabilities in order to achieve the best performance"⁽⁵⁾. (Mufti Ibrahim) states that "the closer the training conditions are to the competition condition (the match), the more beneficial the exercise will be to the player and achieve the goals of reaching the level of match performance"⁽⁶⁾.

And that the method of high-intensity interval training is a method that directly affects the heart and blood vessels for short periods of great and high efforts

that follow the times of rest, it is a quick training that does not take more than (30 minutes). The athlete can perform these periods with any method that suits the state of the heart and is useful for him such as cycling, jumping, jogging, rowing, and going up and down the stairs, it is different exercises to jump, which is called (Plyometric) and these exercises require strength, speed and movements through exerting maximum strength in a short and short time⁽⁷⁾, this helped to create a significant difference between the members of the two groups, especially in bearing the performance of futsal, and based on the above, the combined exercises that were applied in the method of high-intensity interval training and were implemented accurately, creating a state of parity between the training load and the development of the technical skills of the player, which is reflected in the level of skillful performance, as the method of high-intensity interval training is one of the characteristics of working with distinction through high intensity and short rest periods as it is characterized by high intensity, which makes the body in need of more oxygen, these short intense exercises provide physical fitness and high athletic ability, in addition to improving glucose metabolism and burning fats, exercises should be followed for at least a month, and it is advisable to continue to take advantage of its benefits at all times, this is what contributed to the development of the physical aspect of endurance performance as well as the state of repetition and focus on correcting the errors associated with performance, thus it acquired the characteristic of accuracy in the skillful performance of all the skills under consideration by estimating the distance, which led to the development of these skills, successful scoring depends on the presence of two main factors: speed and accuracy. Rapid scoring and high accuracy in hitting the target will surprise the opponent and prevent him from acting to prevent scoring, and that a large percentage of exercises were similar to competition in terms of defense, attack and pressure similar to playing in order to develop put down, scoring and roll, to achieve the greatest possible accuracy in handling and good suppression in training and competition, the gymnasium soccer player must have a high level of physical and skill performance to be able to reach the goal and achieve the required level in competitions, as well as the number of appropriate repetitions that accompanied the training units and the careful selection of the exercises, taking

into account their suitability for the research sample and their capabilities, taking into account the continuous repetition of the exercise as well as the gradation in the level of difficulty, which guarantees performance by all, and this is what was stated by (Ibrahim, 1988) when he believes that “choosing a coach for difficult exercises will increase the experience of some players”⁽⁸⁾. As well as exercises in this way also helped to develop the skill of put down and rolling by linking it with handling, as the process of receiving, controlling and suppressing the ball requires the movement of the whole body, which facilitates taking the appropriate position to possess the ball, regardless of the type and direction of the ball, as the compound exercises among its characteristics helped the player with a high ball sense in order to perform the movement correctly⁽⁹⁾.

Conclusions and Recommendations

Conclusions:

Based on the research results reached within the limits of the research community, the following conclusions were reached:

- The duration of the independent variable, represented by the number of training units, was appropriate in creating a change in the extent to which the experimental research group developed some technical skills in futsal.
- Combined exercises with a high-intensity interval training style helped improve the endurance of futsal players.
- The development of the technical skills of futsal soccer reflected positively on the development of the performance endurance of the experimental research group.

Recommendations:

In light of the conclusions reached by the researcher that proved the effectiveness of using complex exercises using the method of high-intensity interval training, researchers recommend several recommendations: -

- The researchers recommend the use of the combined, the method of high-intensity interval training as a basic parameter when training futsal players.

- The necessity to legalize the training load for combined exercises to suit the type of practitioners in terms of gender, biological and training age, as they have a high impact on the body during performance.

- Conducting similar studies on different activities and age groups.

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Conflict of Interest: None to declare.

Ethical Clearance: All experimental protocols were approved and all experiments were carried out accordance with approved guidelines.

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