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The use of the Polar H9 device was affected in the development of physical endurance of the players of the second Karkh Futsal Football Team

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ABSTRACT

Football is one of the most important team sports that is practiced at different age levels by women and men, young and old. The physical development of this sport depends on sports training and modern technology that has contributed significantly to the development of the sports field in general. Outstanding performance in football requires precise and fast physical abilities that are commensurate with the competitiveness of the game.

Physical endurance is one of the essential elements of football, which requires its improvement through advanced training programs. This research aims to develop physical endurance in the players of the second Karkh futsal team using the Polar H9 device, through the application of scientific training programs to improve their performance.

The importance of the research lies in the development of competitive exercises through training and the development of training strategies based on scientific data. The research indicates that there is a weakness in the endurance of the players, which necessitates the use of the Polar H9 device to analyze and develop the level of endurance.

Competitive exercises based on scientific analysis show a positive impact on the development of endurance in athletes, underscoring the importance of using technology in sports training to improve endurance and tailor exercises to suit their individual needs.

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Chapter One (Introduction to the Research)

First: The Research Problem

Futsal football suffers from challenges related to the development of training methods in line with the goals and requirements of the game, especially in the field of physical endurance. Futsal football is considered a team game that requires a high level of endurance, through the experience of the researcher as the coach of the second Karkh Futsal Breeding Team, it was found that there is a weakness in the endurance of the players of the second Karkh Futsal Breeding Team, especially in some periods of the match. This weakness is attributed to the weakness of the Endurance training, which can be accurately analyzed using devices. Therefore, researchers seek to provide a scientific solution to develop physical endurance in the players of the second Baghdad Al-Karkh education team using the Polar H9 device during competitive training, which enhances their ability to face endurance challenges in matches.

Second: The Importance of Research

The importance of the research is focused on the development of physical endurance of the players of the second Karkh Futsal Breeding Team using modern technology such as the Polar H9 device for the first time in the Karkh II Futsal Breeding Teams, which enables an accurate analysis of physical performance and identification of weaknesses in endurance. Sports training through the use of scientific data to develop advanced training strategies, which contributes to improving sports performance comprehensively.

Third: Research Objectives

1. Preparing competitive exercises using the Polar H9 device to develop the endurance of the players of the second Karkh Futsal Breeding Stage in Baghdad.
2. Learn about competitive exercises usingthe Polar H9 device to develop the endurance of the players of the second Karkh Futsal Preparatory Stage in Baghdad.

Chapter Three (Research Methodology and Procedures)

First: The methodology and community of the research and its sample:

The researchers used the experimental method and identified the research population with the players of the second national team for futsal education, which are (14) players from the original community, and after excluding the goalkeepers, the number of (2) goalkeepers, the number of (12) players became from the original community, and they were reported to be 86%.

Table (1): Equivalence of the two groups (control and experimental) in the pre-test of the speed endurance index

Significance	Error Level	Calculated T value	Officer		Experimental		Unit of Measurement	Variable
			on	Going to	on	Going to		
Insignificant	0.086	1.906	1.242	31.715	1.752	30.502	Second	**30m Speed Test**

Second: Research Test:

"Test Bear Speed: (2014 ،عايد، وآخرون)

- **Test Name:** Shuttle Run (7×20)m.
- **Objective of the test:** to measure the speed tolerance.
- **Tools used:** Measuring tape, whistle, (2) indicators, a running field with a lengthof not less than (25) meters, a stopwatch.
- **Method of performance:** The player stands behind the first indicator and when the whistle is heard, he runs to a distance of (20) m, i.e. to the second indicator and continues back and forth until he reaches a distance of (140) m, as shown in Figure (2).
- **Scoring:** The player records the time it takes to finish the distance (7×20)m."

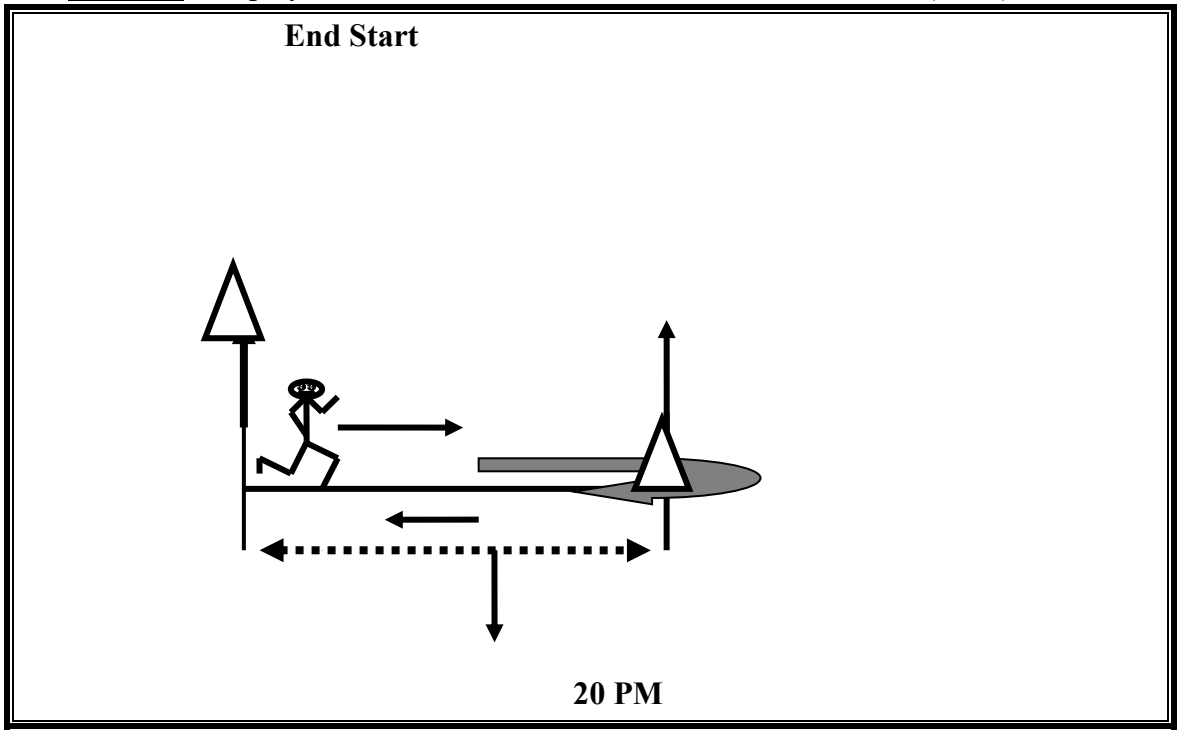

Figure 5: Shuttle Sprint Prolongation Test

Third: The Exploratory Experience

The assistant work team, under the supervision of the researchers, conducted the reconnaissance experiment on four players on 5/2/2025, at two o'clock in the afternoon, from the second breeding of Karkh, noting that they were not selected among the initial research sample. The experiment showed the following results:

1. Confirm the registration and use of **your Polar H9** device by players.
2. The duration and validity of the speed endurance test and its application were ascertained.
3. The work of the assistant team and the accuracy of the required exercises and tests were measured and evaluated accurately and successfully.

Fourth: Pre-test .

On Sunday, 9/2/2025, at 3:30 p.m., the researchers, in cooperation with the assistant team, conducted the pre-test on the sample selected for speed tolerance in the futsal court - Gilgamesh University. Measurement of velocity endurance tests was performed for the experimental and control groups.

Main Experience:

The researchers prepared the training modules starting from the main part, and started implementing the basic experiment on Wednesday, 12/2/2025, and continued until Saturday, 12/4/2025, with an average of three training units per week (Saturday, Monday, and Wednesday), with a total of 24 training units during the special preparation and pre-competition stages, which extended for two months. These modules included a main part that focused on the development of physical abilities, using the high-intensity interval training method, as it is the most suitable to achieve the research objectives.

Competitive speed endurance exercises were applied to the research sample (experimental group) during this period, relying on the **Polar H9** device to accurately adjust the intensity of performance. The high-intensity interval training method was used as part of the training program to improve speed endurance, where the intensity of the

exercises ranged between (80-89%) of the maximum intensity in the athletes. The training intensity was distributed monthly as follows:

- First month: 80-85% severity
- Second month: 85-89% severity
- Average overall program intensity: 84.75%

In distributing the components of the training load based on the maximum intensity of the players' abilities, which was determined using **the Polar H9 device**, the rest periods between the training groups were adjusted according to the pulse measurements through the same device, and the rest period between the groups was set at three minutes. In terms of the size of the exercises, the researchers used the number of repetitions as the basis for planning the training modules, with the aim of ensuring that the objectives of the training program were achieved efficiently and accurately.

Sixth: The Dimensional Test .

On Saturday, 12/4/2025, at 3:30 p.m., the researchers, in cooperation with the assistant team, conducted the post-test on the selected sample to endure speed in the futsal court - Gilgamesh University. Measurement of velocity endurance tests was performed for the experimental and control groups.

Seventh: Statistical Methods:

The researchers used the Social Sciences Statistical Method (SPSS) to extract the statistical results.

Results and discussion

First: The results of the experimental and control groups for the speed endurance test (pre- and post-test):

Table (2): Shows the arithmetic medians and standard deviations of the pre- and post-test of the endurance index

Post-testing		Pre-test		Unit of Measurement	Variables
on	Going to	on	Going to		

1.721	31.925	2.2418	31.715	Second	**Control Group**
1.3980	29.711	1.7515	30.502	Second	**Experimental Group**

Second: The results of the differences for the control sample to endur the speed between the pre- and post-test:

Table (3): Results of the speed tolerance index of L, the calculated value of t , the difference in the arithmetic media, and the significance of the differences and standard deviation between the results of the pre- and post-test

Significance Differences	Level Error	Value (t) Calculated	ASF	A.F.	P	Collection	Unit Measurement	Variables
Moral	0.035	2.864	0.2758	0.6756	0.7900	**Officer**	Second	**Bearing Speed**
Moral	0.03	2.864	0.275	0.675	0.79	**Experimental**		

Third: Discussion of the results Withstand Speed For the experimental and control group For pre and post test:

1. The results shown in Table 3 indicate that there were significant differences in endurance between the pre- and post-tests using the t-test, as the experimental group benefited from this in the post-tests. The researchers attribute these results to the efficiency of competitive training supported by the Polar H9 device, which was ranked according to the Polar H9 device readings.

Information that has improved speed endurance in a competitive environment was presented using Polar H9 monitors. During a match in futsal the team must move faster from defense to attack or the team moves faster from attack to defense repeatedly in order to achieve this physical ability because futsal requires this ability to resemble the nature of the game. Rapid attacks became sudden and then back-to-back defense areas that

researchers emphasized that were present during competitive exercises supported by a device Polar H9 and the defensive duties that have been applied, such as from defensive to offensive and then from offensive to defensive mode have been moved to defensive once competitively (4v4). The combination of these elements is believed to be an important motivator for players, pushing them to complete competitive workouts more accurately, quickly and with greater intensity.

The use of Polar H9 With intensely competitive workouts suitable for training modules Helps promote fitness, which includes endurance Speed. According to both Fadel Kamel Medkour and Amer Fakher, the intensity of the training is gradually increasing. Both assert that "work is being done to make the exercises more difficult as they progress, to achieve continuity and challenge the body's systems and achieve development." (مذكور، وآخرون، 2008)

According to him, "High-intensity training is one of the basic training methods to improve physical abilities based on achieving an adaptation between work periods and recommended rest periods," and according to (Mohammad Reda Ibrahim and Mehdi Ali), "the introduction of various exercises into the training curriculum accurately with the aim of maintaining the athlete's desire to implement the requirements of hard training and turning him from a state of boredom and boredom to a state of happiness, joy and enjoyment during training." The player's movement speeds are recorded during the (Competitive Marinas or match by Polar H9. بسطويسي، 1999( )ابراهيم، وآخرون، 2013) The results of the endurance test in Table (4) showed that the experimental group was significantly superior to the control group in the endurance variable, and the test was effective for the experimental group, as evidenced by the results that also revealed that there is a significant difference in the level of endurance between the pre- and post-tests, and the researchers attribute this development to the use of a device (Polar) During the competitive training modules, these devices improved the performance of the experimental group, although the variety of competitive training did not have a noticeable effect when present.

Using a device Polar The researcher developed a training curriculum that also helped in developing endurance, and this helped in grading the loads by taking into account the difficulty of the exercises and starting from easy to difficult, and Mufti Ibrahim also stressed the importance of this gradation in the exercises (ابراهيم، 2009)

The gradual increase in training loads in terms of intensity, size, comfort, and the components of the training load in competitive exercises, i.e. easy to hard, is another factor that researchers attribute to the development of endurance training, and Mohammad Reda confirmed this point by saying that athletes must implement the training requirements within the limits of their abilities and functional potential at the beginning of each new training period or stage in order to obtain new adaptations that lead to raising their level to the highest possible level (ابراهيم، وآخرون، 2013)

The researchers prove the validity of the justifications for the transformation of the experimental group into a competitive training unit capable of performing the tasks assigned to the players, where the players are prevented from boredom and routine as a result of the repetition of the exercises used, as they are able to move quickly from defense to attack through their quick movements in penetration, passing, and shooting on goal, and when possessing the ball, they move at a high speed from defense to attack, as witnessed by both Mahdi Kazem Ali and Mohammad Reda Ibrahim.(Introducing various exercises into the training curriculum accurately in order to maintain the athlete's desire to implement the requirements of hard training and transform them from a state of boredom and boredom to a state of happiness, joy, and pleasure during training.) (ابراهيم، وآخرون، 2013)

The researchers verify this by looking at increased stamina in players during competitive training and official matches, which revealed an improvement in the endurance of players as recorded by a tool Polar . And this is what he referred to. (الجميلي، وآخرون، 2023) "The athlete's ability to perform different repetitive transition movements, as the athlete's body travels certain distances in the shortest possible period of time" (الجميلي، وآخرون، 2023).

Table 4: Presentation and discussion of the results of the post-test of the endurance index

Significance	Error Level	Calculated T value	Officer		Experimental		Unit of Measurement	Variable
			on	Going to	on	Going to		

Moral	0.035	2.445	1.7210	31.9250	1.3980	29.711	Second	**Withstand Speed**

Fourth: Discussing the results of the speed endurance index for the experimental and control group for the post-test:

The results of the speed endurance test shown in Table 4 showed a clear superiority of the experimental group compared to the control group, demonstrating the effectiveness of the training program applied with the Polar H9 heart rate monitor.Statistical differences between the pre- and post-measurements of the experimental group revealed a significant improvement in the speed tolerance variable, which is attributed to the use of the device during the training modules.

The competitive exercises designed with the help of the device contributed to significantly raising the level of performance of the players, as the training program relied on a gradual methodology in increasing loads, taking into account the intensity and variety of exercises, and starting from easy to difficult. Mufti Ibrahim (2009) emphasizes the importance of this gradual process in the preparation of exercises, pointing out that (The need to move from simple to more complex exercises to ensure the desired physical adaptation is achieved). (2009 ،ابراهيم)

As Mohammadreza Ibrahim et al. (2013) have pointed out: (Gradual training load – whether in terms of intensity, size, or rest periods – is one of the necessary foundations that enable athletes to perform exercises according to their functional abilities, thus reaching higher adaptations that raise their physical efficiency). (2013 ،ابراهيم، وآخرون)

Researchers reinforce this trend by confirming the effectiveness of competitive exercise as a vital means of improving physical performance, as it contributes to enhancing muscular adaptation to motor duty and increases the ability to respond to physical exertion. As (These exercises, which simulate the kinetic reality of the game, contribute to the integration of more than one skill and physical ability at the same time), which was confirmed by Jawad et al. (2015) in their studies. (2015 ،جواد، وآخرون) .

Mehdi Kazem Ali and Mohammad Reda Ibrahim pointed out that (The need to diversify exercises within the training program in order to psychologically motivate athletes and overcome the boredom that accompanies traditional training, stressing that

the introduction of exciting exercises raises the motivation of the players) (ابراهيم، وآخرون، 2013). Fadel Kamel is mentioned and Amer Fakher in (Progress in the training program should be made through a gradual increase in the difficulty of the exercises, ensuring that the challenge continues and the physical development is achieved.) (مذكور، وآخرون، 2008)As Haitham Jawad (2015) pointed out, (The gradual organization of the training load – in terms of intensity, comfort, and repetitions – contributed to the harmony of the internal and external loads, which led to an improvement in the speed endurance within the real potential of the players, especially in conditions similar to matches, warning that the lack of competitiveness may lead to poor execution of exercises and reduced effectiveness) (هيثم جواد، 2015)

The data recorded by the Polar During training and official matches, there was a noticeable improvement in the speed endurance of the players of the experimental group. This was confirmed by Al-Jumaili et al. (2023) who noted that an athlete's ability to perform multiple transition movements in short periods of time is an essential indicator of speed endurance. (الجميلي، وآخرون، 2023)Ahmed Amin Fawzi (2008) also emphasized that (The player's ability to maintain the quality of motor and mechanical performance from the beginning of the match to the end is what distinguishes players who have the endurance of speed). (فوزي، 2008، ص138)

Haitham Jawad et al. (2018) refer to (This quality has become necessary for the modern player, whether in defensive or offensive moves, such as pressuring the opponent or quickly returning to the defense). Thamer Mohsen and others support them in this regard, explaining(Competitive exercises develop basic principles in football such as pressing, reliance, freedom from control, and cutting the ball) (ثامر، 2018)(جواد، وآخرون، 1999 ،محسن، وآخرون)

5. (Conclusions and Recommendations)

First: Research Conclusions:

- Competitive workouts supported by **Polar H9** for the experimental group affect the improvement of the speed endurance index.
- The Polar H9 **should be used** especially for each player to develop the speed endurance of the test kit.

Second: Research Recommendations:

- The importance of using technological devices to support competitive training by coaches to improve the physical aspects especially in futsal football.
- Highlight the Polar H9 **heart rate monitor** in the knowledge of training intensities and breaks.
- Emphasize relying on device readings such as **the Polar H9** to developage-appropriate competitive training for futsal teams.

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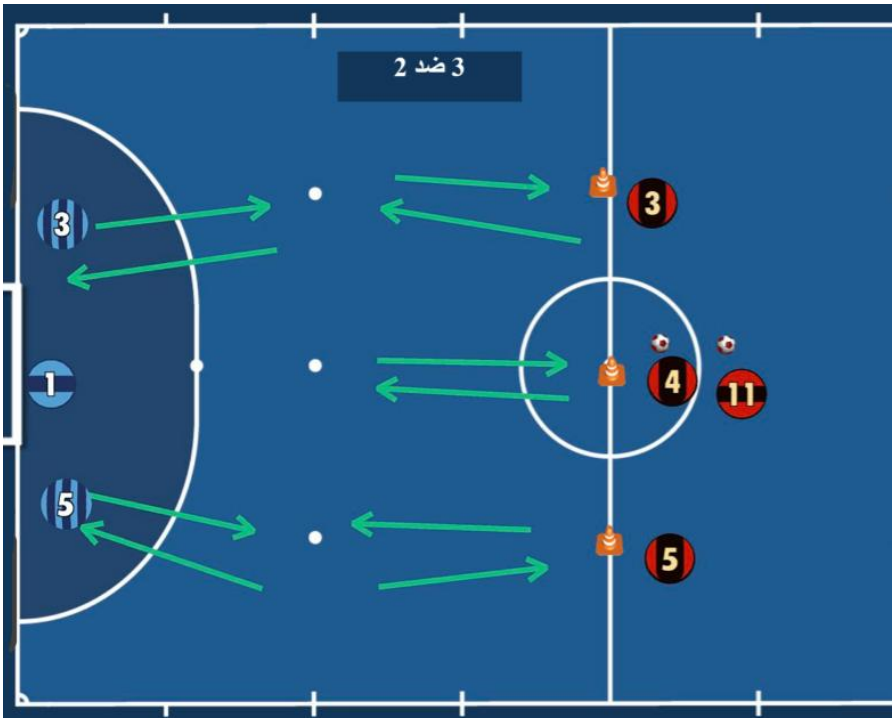
Accessories

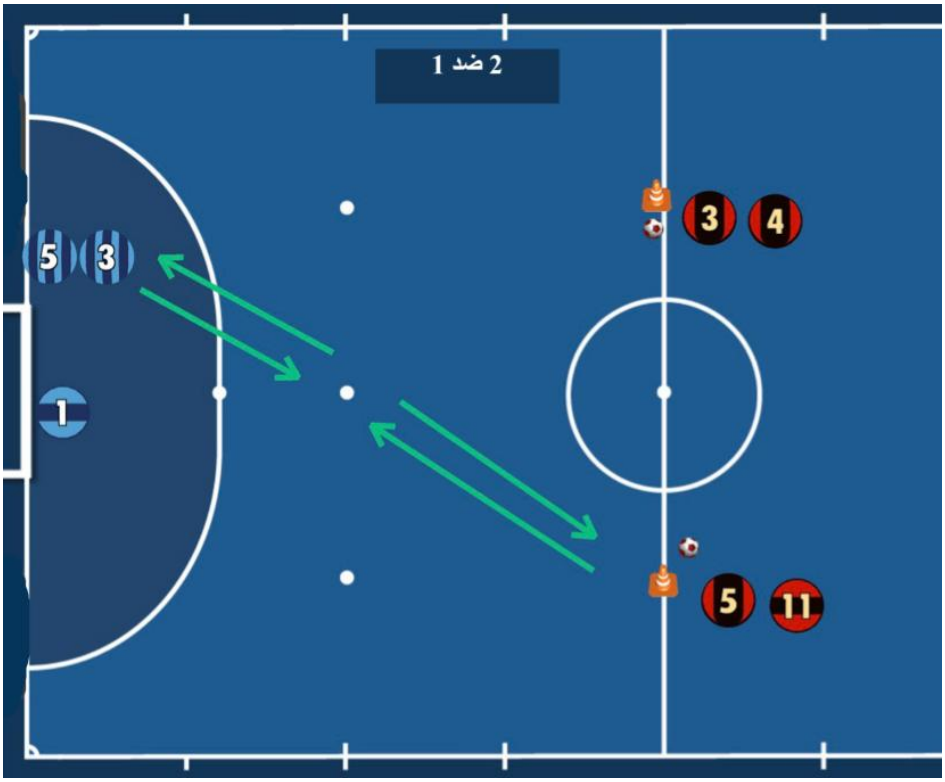
Exercise (1)

The drill is done on the half court (20×20) m and the distance between the attacking players and the indicator (10) m and between the defending players and the indicator (10m), and when the first whistle is heard, the defender and the attacker run to the middle and then return to their place and repeat (for 15 seconds), then three attackers go off with the ball to score on the goal and the defenders try to defend the goal so that The play becomes competitive (3v2) possession of the ball by (3) players and the ball is cut by the defenders to score a goal, and the practice continues until the final whistle of the coach and the end of the specified duration of the exercise.



Exercise (2)

The drill is done on the half court of (20×20) m and the distance between the attacking players and the indicator is (10) m, and between the defending player and the indicator (10m), and when the first whistle is heard, the defender and the attacker run to the middle and then return to his place and repeat (for 15 seconds), then the attackers go off with the ball to score on the goal and the defender tries to defend the goal so that the game becomes competitive (2v1).) Possession of the ball by the players and the ball is cut off by the defender to score a goal, and the practice continues until the final whistle of the coach and the end of the duration of the exercise.



Sample Training Modules

Training Module : Seventh **Location: Futsal Stadium - University of Gilgamesh**

Week: First **Course Date: Saturday 14/2/2015**

Month: First

Objective: Develop competitive speed endurance

The main section of the training module during the special preparation period

Total Time	Comfort between groups	Totals	Repetition	Interstitial comfort	Performance Time	Hardship	Exercise Name
13 KD	2.5 D	2	3	2 D	25 S	80%	Exercise
13 KD	2.5 D	2	3	2 D	25 S	80%	Exercise

Sample Training Modules

Training Module: Thirteenth **Location: Futsal Stadium - University of Gilgamesh**

Week: First **Course Date: Saturday 8/3/2025**

Month: The second

Objective: Develop competitive speed endurance

The main section of the training module during the special preparation period

Total Time	Comfort between groups	Totals	Repetition	Interstitial comfort	Performance Time	Hardship	Exercise Name
13 KD	2.5 D	2	3	2 D	25 S	85%	Exercise
13 KD	2.5 D	2	3	2 D	25 S	85%	Exercise