Journal of Physical Education
Volume 37 – Issue (1) – 2025 Open Access
P-ISSN: 2073-6452, E-ISSN: 2707-5729
https://jcope.uobaghdad.edu.iq

The impact of compound exercises (physical) supported by information technology (GPS Ubiko and Polar H9) on developing endurance in football players

Haitham Jawad Kadhim [1]

[1] Ministry of Education/ Baghdad Karkh Second Education Directorate

DOI:
https://doi.org/10.37359/JOPE.V37(1)2025.2251

Article history: Received 3/ February/2025 Accepted 10/ March/2024 Available online 28/ March /2025

Abstract

Among the most often played team sports, football is played by players of various ages and skill levels. This sport's physical growth is mostly dependent on methodical training aided by contemporary technology, which has greatly improved athletic performance. High endurance capacity is necessary for exceptional football performance in order to maintain constant physical effort during practices and games, especially considering the competitive nature of the sport. This study aims to enhance speed endurance capacity among players of the Al-Talaba youth team (aged 19) in Baghdad by applying advanced technological tools such as the GPS Ubiko tracking device and the Heart Rate monitoring device (Polar H9). The implication of the research lies in introducing compound exercises based on modern technology, contributing to improved players' physical performance and the development of training strategies founded on accurate data. The research highlights the necessity of developing speed endurance among players, which requires the use of modern technologies for performance analysis and the implementation of compound exercises (physical) to enhance their ability to sustain physical effort during matches. The results revealed that exercises utilizing devices such as GPS and Polar significantly improve speed endurance, highlighting the importance of mixing these technologies into sports exercise programs to achieve optimal benefits.

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Keywords: Compound Exercises, Speed Endurance, GPS Ubiko, Polar H9.

1Ministry of Education/ Baghdad Karkh Second Education Directorat,
haitham.ali2404p@cope.uobaghdad.edu.iq

Introduction

To satisfy training goals and game needs, training techniques are always changing. Training regimens for football, a competitive team sport, must be created to satisfy the demands of speed endurance required for game performance. The inclusion of the ball in training sessions and competitive elements are among these prerequisites.

According to the researcher's experience as a trainer at Al-Talaba Sports Club, the youth players (19 years old) have a physical deficiency that affects their ability to maintain high speeds throughout specific game phases, particularly in the latter half. The absence of emphasis on high-speed endurance training at speeds above 21 km/h is the main cause of this impairment. GPS tracking devices, which are important tools for evaluating a player's physical performance during training and matches, are used to measure these speeds. (Kadhim, 2024b)

The researcher suggests using advanced IT technologies such as GPS Ubiko and Polar H9 to address the problem as they help provide the coach with accurate data on the physical performance and movements of players during training sessions and during matches. These technologies, supported by the development of fourth and fifth generation communication networks (Maab Fathi, et al., 2022), monitor performance and analyse the collected data to measure endurance at high speeds. This scientific approach relies on analysing the data collected from the devices and using integrated (physical) training programs that focus on improving the players' ability to maintain high speeds, thus improving the quality of training and increasing the efficiency of the team's performance in matches, which positively affects the team's overall results. (Kadhim et al., 2021)

The importance of study

The study importance lies in providing training modules (physical) to help young players (19 years old) at the AlTalaba Sports Club to develop their speed endurance. Using advanced IT technologies such as GPS Ubiko and Polar H9, the study follows a scientific approach that makes it possible to measure and analyze physical performance throughout training and competition with high accuracy. This technology provides reliable scientific data used to create training plans that increase players' ability to maintain high speeds and raise training standards. Players' performance in matches may improve and thus also help the team achieve its goals and win matches.(Manaf, 2022)

Research Objectives

- By using Information Technology devices like GPS tracking devices Ubiko and Polar H9 to preparing compound exercises for develop speed endurance for youth players of AlTalaba Sports Club (19 years old) in Baghdad.
- By using Information Technology devices like GPS tracking devices Ubiko and Polar H9 to Knowing the effect of compound exercises (physical) in developing speed endurance for youth players of Al-Talaba Sports Club (19 years old) in Baghdad.

Research Fields:

• **The Field of Human:** Youth Players of the Al-Talaba sport Club (19 years old) 2024 in Baghdad.

• **The field of Time:** The period from (10/9/2024) to (12/9/2024).

• **The Spatial field:** The bitch of the College of physical education and sport sciences - University of Baghdad.

Journal of Physical Education
Volume 37 – Issue (1) – 2025 Open Access
P-ISSN: 2073-6452, E-ISSN: 2707-5729
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Terms:

- **Ubiko GPS device:** It is a technological device used in the sports field, especially in football, to track and analyze the physical performance of athletes during training sessions and matches. The device collects various accurate data such as distances and speeds, which helps fitness trainers evaluate the performance of players. It is characterized by ease of use and accuracy of data, which makes it an effective tool for developing training programs based on its readings. It is an important tool for improving the athletic performance of players in various team and individual sports, as shown in Appendix (1).
- **PolarH9 device**: It is an advanced device used to monitor heart rate and is characterized by its high accuracy in providing reliable readings. It is widely used in various sports fields and is considered an important tool for tracking physical activity and measuring heart rate, training intensity and calories expended during training units and matches. Coaches can use it to improve training systems by pairing it with compatible tablets via Bluetooth. As mention later in the first Appendix.

Related works

The study by Haitham Jawad et al. (2024) (Jawad, Lateif, & Fathi, 2024)**:**

The study's goal was to create competitive drills that would improve the speed of AlTalaba Sports Club players competing in the Iraqi Stars League utilising GPS devices like PlayertekPlus and PolarH9 devices. The study used an experimental research approach, and the findings demonstrated that the experimental group's physical attributes, especially speed, were significantly improved by integrated (physical) exercises created using GPS tracking device information. Additionally, the study stressed the value of using the PolarH9 for monitoring the heart rate during the training to attain the best results and the relevance of using the GPS tracking device to help athletes improve their speed on an individual basis.

Other Study in 2023 by the student Karrar A. Karim:

A master's dissertation with the title "An Analytical Study to Evaluate Physical Condition Using Information Technology for Players of AlTalaba Club in the Iraqi Premier League.". The objective of study was to assess the physical state for AlTalaba footballers in the League who use information technology. The research utilised the PLAYERTEKTEAM gadget and a descriptive survey approach. Depending on the skill levels of the other teams, the researcher discovered that the GPS device's readings were either positively or adversely correlated with Al-Talaba Club's style of play. In addition to suggesting that other Iraqi league clubs that have not yet implemented it utilise the PLAYERTEKTEAM equipment, the student emphasised the need of using it to measure the physical state of soccer players. Additionally, the study recommended adding lectures on the device's use to the coaching programs offered by the Asian-Football-Confederation (AFC).

Other Study in 2018 by Alamir Haider H.:

A research paper entitled "Using GPS Recorder and Polar H10 Devices to Analyse Some Physiological and Physical Indicators and Compare Them Between Playing Positions for Players in the Iraqi Premier League." Using electronic instruments that assess numerous physical characteristics and heart rates, the study aimed to investigate the specificities of each football playing position. The study used a descriptive methodology and discovered

that the Polar H10 and GPS Recorder devices produced different findings for heart rate, speed, distance travelled, and other physical characteristics. In order to control exercise load and evaluate the physiological and physical prowess of League players, the study suggested using contemporary electronic gadgets.

Other Study 2021 by John E., Michael S., et al.:

A research paper entitled "Impact of GPS Technology on Sprinting Performance in Youth Soccer Players." The research looked at GPS device may assist young football players become more proficient sprinters. The findings demonstrated that using GPS tracking devices greatly improved young players' performance during training and competition by raising their top speed and total distance covered at high speeds(John R, et al., 2021).

Method and tools

First: The Research methodology, and the community of research and sample:

The compound exercise and population used by the researcher were defined as the youth players of AlTalaba Sports Club (19 years old) of 24 players. Additionally, out of the 240 players in the original community of the central region of the youth league, 20 players remained for the study after goalkeepers and injured players were subtracted, for a total of 5 players. This suggests that the ratio of the research community to the original community was 8.33%. Using a random approach, the remaining individuals were split into two groups: a control set and an experimental set. This led to the assignment of ten players to the experimental set and ten players to the control set. Table 1 indicates that the two groups are equivalent.

Table (1): It indicates the equivalent of the two sets (control, experimental) in pre-test for the endurance index.

Variable quantity	Units	Experimental		Control		T Value	Error-Level	Significance
Speed endurance Test	Second	Mean	sd	Mean	sd	0.605	0.553	Not Substantial
		29.3490	0.4828	29.4750	0.4475			

Second: The test of the Search:

Speed endurance test

- **Test Name:** 180-Meter Sprint Test from a Stand Start (Jawad, 2015)
- **Objective of the Test:** To measure speed endurance.
- **Equipment:** Whistle, Stopwatch, Markers (4) with a distance of 15 meters between each marker.
- **Test Procedure:** After giving the starting signal (whistle), the player starts from the first marker (the start) to the second marker and returns to the start and runs towards the third marker and returns to the start and then runs towards the fourth marker and returns to the start, and thus the player has completed the test. As in Figure (1) which shows the rebound running test (180m).

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Volume 37 – Issue (1) – 2025 Open Access
P-ISSN: 2073-6452, E-ISSN: 2707-5729
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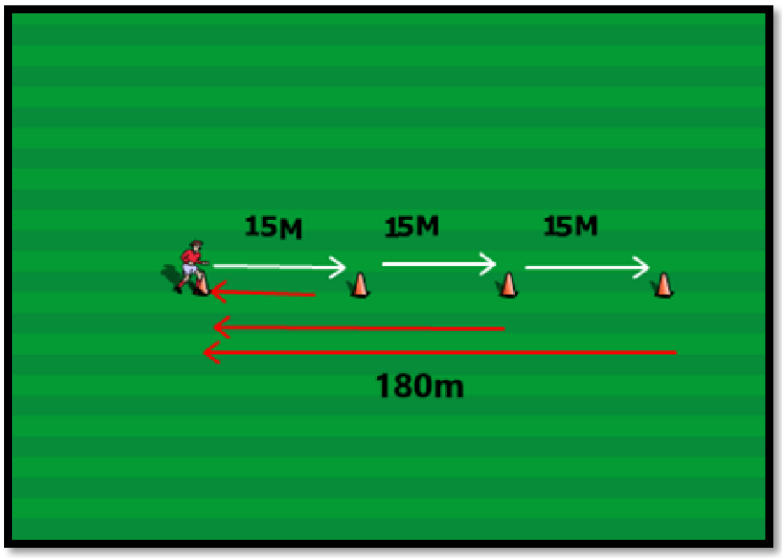

Figure (1): The test of Speed endurance

Third: Trial Study

On 10/14/2024, at 11:00 AM, The researcher and the assistant work team, under the supervisor of the scientist, conducted a survey experiment on five youth players of AlTalaba Sports Club (19 years old), who were not part of the initial research sample. The experiment yielded the following results:

- Confirm the validity of the Ubiko and Polar H9 GPS devices in recording data and their suitability for use by players.
- Verify the validity of the test of speed endurance and its ease of application, in addition to ensuring the duration of the test.
- Evaluate the validity of the compound (physical) exercises and measure the effectiveness of the support team and its ability to implement the required competitive activities accurately and successfully..

Fourth: Pre-Test

At 4:30 pm on Saturday 10/19/2024, the researcher, with the help of the assistant work team, conducted the pretests on the study trial at the College of physical education and sport sciences Stadium - University of Baghdad. During the test of the speed endurance of the experimental and control sets was measured.

Fifth: The primary experiment

The primary experiment, prepared on Thursday 10/24/2024, and continued until Tuesday 12/24/2024, at a rate of three days per week (Thursday, Saturday, Tuesday), with 24 training units over two months of the special preparation phase and before the competitions. These units included part of the main section, with a focus on the physical aspect, as a specific time was allocated for it and the high-intensity and repetitive interval training method was used as the most appropriate.

The Compound exercises (physical) speed endurance was used in the experimental set during the special training period and before competitions. To ensure the accuracy of measuring training intensity, the researcher relied on GPS Ubiko and PolarH9 devices to determine the required intensity. The researcher used the high-intensity and repetitive

interval training method within the speed endurance training units, where the exercise intensity ranged between (85-97%) of the players' maximum intensity. The monthly intensities were distributed as follows:

• The intensity of First month: 85-91%
• The intensity of Second month: 91-97%
• The average intensity: 91%

The distributed of the research was the components of the training load based on determining the maximum intensity of the players' abilities by use the GPS devices Ubiko and PolarH9. Rest periods were also determined based on pulse measurements via the same devices to adjust training rest, and the rest between sets is (3) minutes. Regarding determining the exercise volumes, the researcher relied on repetition as a basis for planning training units, which ensures that the goals of the training program are achieved accurately and efficiently.

Sixth: Post-Test

Through the help of the assist team, the post-test was conducted on the study sample on Friday 12/27/2024 at 4:30 pm. The test was implemented in the College of Physical Education and Sports Sciences bitch at the University of Baghdad, where the speed endurance of both the experimental and control sets was measured.

Seventh: Statistical Methods

The researcher used the Statistical Package for Social Sciences (SPSS) to extract and analyze statistical data.

The Result and the discussion

First: The result presentation of both (Pretests, Post-tests) for Speed endurance for both (experiment and Control) sets:

Table (2): It illustrates both (means and standard deviations (sd)) for pretest and posttest of the endurance index.

Variable quantity	Units	Pretest		Post-Test	
		Mean	sd	Mean	sd
Control Set	Second	29.4750	0.4475	29.2500	0.5035
Experimental Set	Second	29.3490	0.4828	28.5450	0.9252

Second: The result presentation of the Differences Between Pretest and Post-Test of the Speed endurance in the control set:

Table (3): illustrate results of the change in both (means, standard deviations (sd)), and T value, and the significance of the differences between the pretest and post-test for the speed endurance indicator in the control set.

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P-ISSN: 2073-6452, E-ISSN: 2707-5729
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Variables quantity	Units	Set	Mean	sd	Mean difference (F - S)	T Value	Error Level	Significance of Differences
Speed	Seconds	Control	0.2250	0.3489	0.1104	2.0390	0.072	Significant
		Experimental	0.8040	0.5812	0.1837	4.3740	0.002	Significant

Third: The result Discussions of Pretest and PostTest for the speed endurance in both (the Experiment and the Control) sets:

The results in Table (3) indicate that there are a differences in the level of speed endurance between the pretest and posttests using T test, as the experimental set showed a significant improvement in the post-tests. The attributes of research this improvement to the effectiveness of compound (physical) exercises, which depend on integrating two or more basic skills into an organized motor performance, (Kazim et al., 2019) which contributes to the development of physical and skill capabilities. These exercises were designed based on accurate readings from the GPS tracking device, as the training program was prepared with great precision to determine the level of intensity, rest periods, and the number of repetitions required.

(Al-Khashab, 1999) also explained that "compound exercises contribute to developing the physical qualities and functional abilities of players, which helps the body adapt to high physical effort and different playing conditions." (Al-Saffar, 1987) confirmed that these exercises "allow the player to acquire more than one skill or physical ability during training".

According to (Qassem, et al., 2011), "the extent of the neural response and its compatibility with the muscular response to perform movements in the shortest possible time is a decisive factor for implementing motor duties, which helps achieve a balance between the external and internal training load, while enhancing the intense neural and muscular response for short periods.".

The study also relied on the use of IT devices such as GPS and Polar H9, which helped the team significantly improve their speed endurance, which was reflected in their ability to quickly transition between defense and attack, which enhanced counterattacks and contributed to scoring goals. As for the complex exercises, they contributed to developing performance, such as defensive tasks like intercepting the ball and monitoring opposing players, which (Jawad, 2019) described as "complex exercises that should be exciting, in addition to their importance in raising the player's motor and skill efficiency in different playing situations, as well as their cognitive, perceptual and physical importance for the player". It is believed that the combination of these elements constitutes an important incentive for athletes, prompting them to complete training with greater accuracy, speed and intensity. The researcher confirmed that the integration of GPS tracking devices and the use of diverse training programs enhances physical fitness, including speed endurance. As (Jawad, et al., 2024) and (Madhkur, et al., 2008) indicated, the necessity of gradually

increasing the intensity of exercises to achieve the required challenge and develop physical systems, and both confirm that “work is done to make exercises more difficult as they progress, to achieve continuity and challenge the body’s systems and achieve development.” (Bastawisi, 1999) indicated that "high-intensity training is one of the basic training methods for improving physical abilities based on achieving adaptation between work periods and recommended rest periods." (Ibrahim and Ali, 2013) also explained that diversifying exercises helps break the state of boredom among athletes and motivates them to train effectively. According to (Turki, et al., 2016) and (Jawad, et al., 2019), transitional speed includes the player's ability to move quickly and efficiently in different directions, whether in wide or narrow spaces, with full control of the ball. This shows the importance of combining the neuromuscular response and performance speed to achieve the required efficiency, as explained by (Qasim, et al., 2011), "the extent of the neurological response and its compatibility with the muscular response to perform movements in the shortest possible time".

Table (4): The Result of Post-Test for the Speed endurance

Variable quantity	Unit	Experimental set		Control set		T Value	Error Level	Significance
Speed endurance Test	Second	Mean	sd	Mean	sd	2.116	0.048	Significant
		28.5450	0.9252	29.2500	0.5035			

Fourth: The result and the discussion Between both (the Experimental and the Control) sets in the Post-Test for the speed endurance Index

The results of the speed endurance test shown in Table (4) showed a significant superiority of the experimental set compared to the control set in the speed endurance variable. The test also proved its effectiveness for the experimental set, as the results showed significant differences between the pretest and post-tests. This development is attributed to the use of the GPS tracking device and the heart rate monitor (PolarH9) during the implementation of the training units. The compound exercises applied with the help of these devices contributed to significantly improving the performance of the experimental set. The training curriculum prepared by the researcher also played a fundamental role in developing the speed endurance trait, through systematic gradual increase in loads, taking into account the difficulty of the exercises and starting training gradually. (Kadhim, 2024a) Mufti Ibrahim stressed the importance of this gradual approach in designing exercises to achieve the required physical adaptation and develop performance, saying "If the difficulty of the exercise is increased in the same training unit, the gradual approach from first step (easy) to difficult must be taken into account" (Ibrahim, 2009). The gradual increase in training loads, (Mousa & Kadhim, 2023) whether in terms of strength, size, rest periods, and components of the load in general, which follows the principle of moving from easy to difficult (as in compound exercises), is a major factor that contributed to the development of speed endurance exercises. (Kazar & Kazim, 2020) Muhammad Reda Ibrahim pointed out the importance of this gradual approach, emphasizing its role in improving physical performance and enhancing the ability of players to adapt to the increasing requirements of training, saying "The increase in gradualism will require athletes to implement training requirements within the limits of their capabilities and functional abilities 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" (Ibrahim, et al., 2013)

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P-ISSN: 2073-6452, E-ISSN: 2707-5729
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The researcher confirms the validity of the justifications for the experimental set's transition to using compound (physical) training units as an effective means of developing physical performance. This depends on enhancing the adaptation of muscle sets and their acclimatization to the motor duty, which enhances the ability to adapt to physical effort and respond positively to it. Compound exercises are considered one of the diverse and necessary means for developing a football player, as they follow motor paths derived from the game and combine more than one skill and physical ability. (Kadhim, 2023) These exercises are performed in conditions similar to those of official matches, which was confirmed by Jawad et al. (2015) in their research (Jawad, et al., 2015). This was witnessed by both Mahdi Kazim Ali and Muhammad Redha Ibrahim. "Introducing various exercises into training curricula in a precise manner in order to keep the athlete's desire to carry out the requirements of strenuous training and transform them from a state of boredom and tedium to a state of happiness, joy, and enjoyment during training." (Ibrahim, et al., 2013) and it was also confirmed by Fadhel Kamel Madhkur and Amer Fakher "In order to progress and advance in the training curriculum, work is done to make the exercises more difficult as they progress, to achieve the survival and continuity of the challenge of the body's systems and achieve development" (Madhkur, et al., 2008) "Through organizing the training curriculum that was determined in a precise manner in terms of the scientific time period for intensity, rest, and repetitions, which contributed to the harmony of the external training load with the internal load, which in turn led to the development of speed endurance within the players' capabilities and abilities in conditions similar to the match, and the absence of a competitive atmosphere in the exercises leads to boredom and failure to implement the repetitions correctly, meaning (with one intensity)." (Haitham Jawad, 2015) The researcher confirms this by observing the improvement in the players' speed endurance during compound (physical) training and during official matches, as the data recorded by the Global Positioning System (GPS) showed a noticeable development in this aspect. Al-Jumaili et al. (2023) pointed out this point, stressing the importance of compound training in improving speed endurance and developing the players' physical performance, as (Al-Jumaili et al., 2023) stated "the athlete's ability to perform various repetitive transitional movements, as the athlete's body covers certain distances in the shortest possible period of time" (Al-Jumaili et al., 2023). , as Ahmed Amin Fawzy confirmed by saying "What is required of the player is not only the quality of performance and mechanism, but what is required of him is to have the ability to withstand speed, which makes the player able to perform the skill with consistent quality and mechanism at the beginning of the match as well as at its end" (Fawzy, 2008, p. 138)

Players at the present time are distinguished by their ability to withstand speed in the defensive and offensive parts of the field and movements in all parts of the field such as pressuring the competitor, supporting and escaping from the competitor to score the goal and quickly returning to the defense areas as mentioned by Haitham Jawad and others (Jawad, et al., 2018) as well as Thamer Mohsen and others in his saying "These important exercises are what develop the important principles of football such as pressure, support, liberation from the competitor and cutting". (Thamer Mohsen, et al., 1999)

The Global Positioning System (GPS) calculates the player's ability to run distances at high speed during the match. A player's total speed endurance distance during a match can range from (1-2.5) km per match, however this can vary depending on the player's position, playing style and game dynamics. In these intense periods, players can run a speed distance

of more than (150-200) m. The longer his speed endurance distance during a match, the higher his physical fitness in speed endurance. (CatapultSport, 2022)

The research Findings and suggestions

I. The Findings:

- Compound (physical) exercises based on readings from modern technological devices such as the Ubiko tracking device for the experimental set have a significant impact on enhancing the physical component (speed endurance).
- It is essential that each player uses a dedicated GPS tracking device in order to develop his/her speed endurance.
- A dedicated device like the PolarH9 for each player to monitor heart rate should be used through speed endurance exercises.

II. The suggestions:

- Emphasizing the need for fitness trainers in the Iraqi Premier League to use GPS monitoring devices to improve other physical features of their training.
- Highlighting the importance of fitness trainers in the Iraqi Premier League using the PolarH9 heart rate monitor to improve different physical features.
- Emphasizing that fitness experts in Iraqi Premier League rely on readings of the above devices to design competitive exercises that help each player improve other physical qualities.

The Acknowledgments:

I would like to giving thanks and gratefulness to AlTalaba Sports Club for helping and providing me the support and the chance to complete this research.

Appendices

Sample of Training Units and Exercises:

Training Unit 1

- **Location:** Baghdad University, Jadriya
- **Week:** First
- **Training Date:** Tuesday, 24/10/2024
- **Month: First**
- **Goal: Speed endurance Development**

Main Section of the Training Unit during Special Preparation Phase

Exercise Name	Intensity	Performance Time	Rest Between Repetitions	Repetitions	Sets	Rest Between Sets	Total Time
Speed endurance (1)	%88	25sec	2 د	3	2	2.5min	13 min
Speed endurance (4)	%85	25sec	2 د	3	2	2.5min	13 min

Training Unit 5

- **Location:** Baghdad University, Jadriya
- **Week:** Second
- **Training Date:** Wednesday, 30/10/2024

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P-ISSN: 2073-6452, E-ISSN: 2707-5729
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- **Month:** First
- **Goal:** Speed endurance Development

Main Section of the Training Unit during Special Preparation Phase

Exercise Name	Intensity	Performance Time	Rest Between Repetitions	Repetitions	Sets	Rest Between Sets	Total Time
Speed endurance (2)	%90	25sec	2min	3	2	2.5min	13min
Speed endurance (4)	%90	25sec	2min	3	2	2.5min	13 min

Training Unit 9

- **Location:** Baghdad University, Jadriya
- **Week:** Second
- **Training Date:** Sunday, 24/11/2024
- **Month:** Second
- **Goal:** Speed endurance Development

Main Section of the Training Unit during Special Preparation Phase

Exercise Name	Intensity	Performance Time	Rest Between Repetitions	Repetitions	Sets	Rest Between Sets	Total Time
Speed endurance (4)	%94	30sec	2min	3	2	2.5min	13.5min
Speed endurance (5)	%92	30sec	2min	3	2	2.5min	13.5min

Training Unit 10

- **Location:** Baghdad University Campus, Jadriya
- **Week: Second**
- **Training Date:** Tuesday, 15/11/2022
- **Month:** Second
- **Goal:** Speed Development

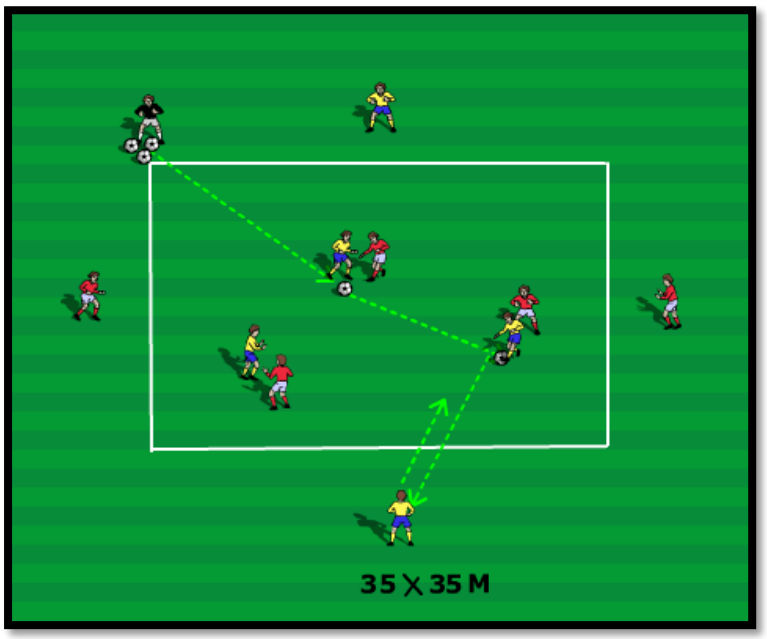
Main Section of the Training Unit during Special Preparation Phase

Exercise Name	Intensity	Performance Time	Rest Between Repetitions	Repetitions	Sets	Rest Between Sets	Total Time
Speed endurance (1)	%97	25sec	2min	3	2	2.5min	13 min

Exercise Name	Intensity	Performance Time	Rest Between Repetitions	Repetitions	Sets	Rest Between Sets	Total Time
Speed endurance (6)	%95	25sec	2min	3	2	2.5min	13 min

Speed Endurance Exercise (1)

The exercise is done in the form of a square (35 x 35) m. There are (6) players inside the square and (4) players outside the square on each side of the square. There is a coach outside the square with balls. When the whistle is heard, the coach hands the ball to one of the two groups and the game becomes competitive (3 vs. 3). The team with the double bus ball plays with the support, then switches with the support players after the end of the specified time for the exercise.



Speed Endurance Exercise (2)

The exercise is done in a rectangular shape (40 x 20) m with two large goals (legal) and there are (4) players (two defenders and two attackers) in the middle of the field on the right side and (4) players (two defenders and two attackers) in the middle of the field on the left side and there is a coach on each side. When the whistle is heard, the coach hands it to the defending players and they try to move the ball to the other half of the field without entering the other half of the field so that the game becomes competitive (2 vs. 2) between the players and the attackers and scoring on the goal. In the event that the ball is cut off, the defending players move the ball to the other half of the attackers and score on the goal and so on until time runs out.

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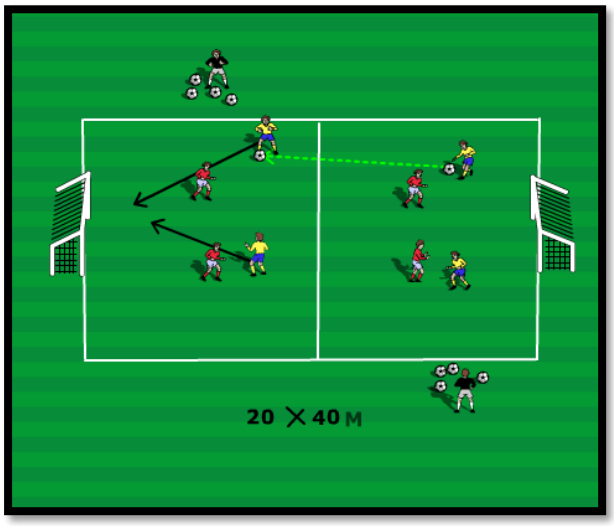
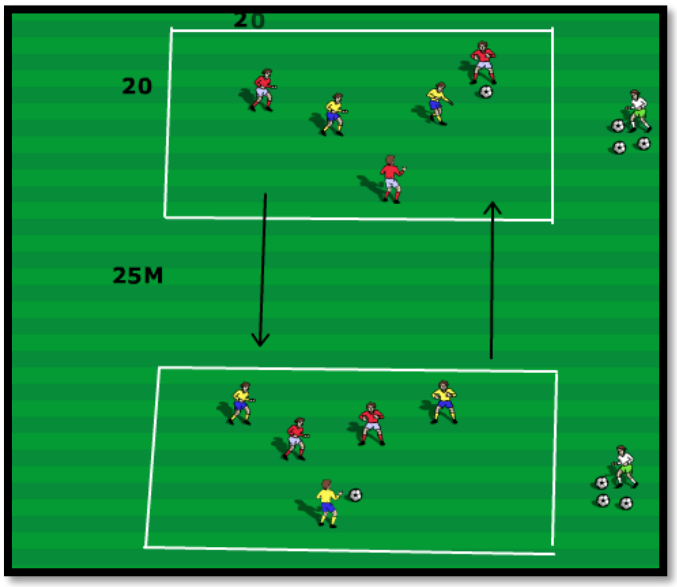
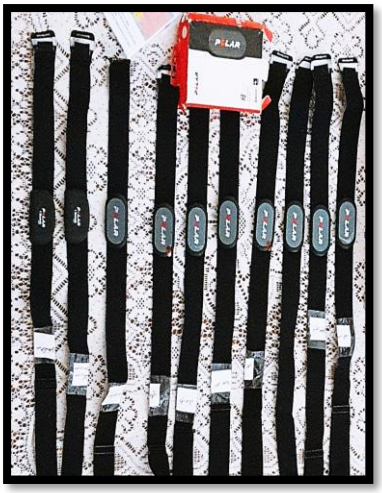


Speed Endurance Exercise (3)

The exercise is done in the form of two squares (20 x 20) m, with a distance of (25) m between them. There are (5) players in each square, and there is a coach and an assistant coach with balls on each square. When the first whistle is heard, the coach hands the ball to the three players so that the game becomes competitive (3 vs. 2) with possession of the ball by (3) players and interception by the defenders. When the second whistle is heard, the two groups exchange places in the two squares, then the coach hands the ball to the three players and the game becomes competitive (3 vs. 2) again. The exercise continues until the end of the specified period for the exercise.



<u>Appendix 1:</u> Images of GPS Ubiko and Polar H9 Devices



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Volume 37 – Issue (1) – 2025 Open Access
P-ISSN: 2073-6452, E-ISSN: 2707-5729
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Journal of Physical Education
Volume 37 – Issue (1) – 2025 Open Access
P-ISSN: 2073-6452, E-ISSN: 2707-5729
https://jcope.uobaghdad.edu.iq

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