TPM Vol. 33, No. 2, 2026
ISSN: 1972-6325
https://www.tpmap.org/

Open Access

THE EFFECT OF A PROPOSED TRAINING PROGRAM USING THE HIGH-INTENSITY INTERVAL TRAINING METHOD ON THE MAXIMUM AEROBIC SPEED OF FOOTBALL YOUNG PLAYERS (UNDER 17 YEARS OLD)

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RECEIVED: 19/10/2024

Abstract:

This study aimed to identify the effect of high-intensity interval training method on developing the maximum aerobic speed of football players under 17 years old. To achieve that, the study was conducted on a sample of 40 players belonging to the Second National Division (Central-East), selected intentionally, in which 20 players represented the experimental group, on which an 8-weeks training programme based on the High-intensity interval training method was applied with one training session per week, while the remaining 20 players represented the control group.

To build the program, we relied on scientific standards by reviewing previous and similar studies, as well as taking into account the opinions of specialists in the field, including trainers and physical trainers. The Yo-Yo intermittent Recovery Test was used to measure maximum aerobic speed, where a pre-test and post-test were conducted for the two groups (control and experimental), and the data were processed using the SPSS statistical processor.

The statistical processing of the obtained results showed that:

- There are no differences of a statistical signification between the results of the pre-test and post-test for the control group.
- There are differences of a statistical signification between the results of the pre-test and post-test for the experimental group, which are in favor of the post-tests.
- There are differences of a statistical signification between the results of the post-tests of the two groups, which are in favor of post-tests of the experimental group.

Key words: training programme, maximum aerobic speed, football, high-intensity interval training method, football players under 17 years.

INTRODUCTION

Study problem:

Football is considered as one of the sports that has benefited from the scientific development witnessed in the science of sports training, by benefiting from various methods and theories that contribute to the development of physical aspect of players. However, the maximum aerobic speed is considered as one of the most important physical requirements that a football player needs in various situations imposed on him by the match. In the light of this, the player is prepared from a young age with the quantity and quality that qualifies him to be a player with skill and tactical competence that enables him to accomplish individual and group duties, and quickly make decisions in a timely manner throughout the match.

We have noticed that the majority of coaches do not depend on developing maximum aerobic speed, so we decided to research this topic, which is of a remarkable importance in the field of sports training, especially for football players under 17 years old, by proposing a training program in the manner of high-intensity interval training aimed at developing maximum aerobic speed. This made us pose the following problem:

- Does the proposed high-intensity interval training program have a positive effect on developing maximum aerobic speed for football players under 17 years old?.

It has become necessary to pay attention to developing the elements of physical fitness that affect the success of performing basic skills, especially maximum aerobic speed. Therefore, the coach and the physical trainer work to develop this indicator in addition to various playing skills. Special physical abilities are a basic requirement for the modern game of football according to the nature of performance. The situations imposed by competition and these requirements must be met by players of this game so that they can progress in training and reach high sporting levels.

This study aims to achieve the following objectives:

1. Detecting the effectiveness of the proposed training program to develop maximum aerobic speed in football players under 17 years old.
2. Identifying the optimal method for training maximum aerobic speed -VMA- 3. It enables coaches to evaluate training programs and help them to identify the extent of athletes' response to different training programs.

Study hypotheses:

- ✓ There are statistically significant differences between the results of the pre-test and post-test for the control group, which are in favor of the post-tests at the significance level $\alpha = 0.05$.
- ✓ There are statistically significant differences between the results of the pre-test and post-test of the experimental group, which are in favor of the post-tests at the significance level $\alpha = 0.05$.
- ✓ There are statistically significant differences between the results of the post-tests of the two groups, which are in favor of the post-tests of the experimental group at the significance level $\alpha = 0.05$.

INTRODUCTION:

Football is considered as one of the sport events that has widely benefited from the scientific development witnessed in the science of sports training, through benefiting from methods and theories that contribute to the development of sports performance. Among the aspects of preparation that have been the focus of interest of researchers in the sports field are the physical aspects. This is done by looking for training methods which contribute to developing physical abilities.

Since football is one of the most popular types of sports in the world, this development has affected it. We see the level of sports teams developing day after day, and the performance of skills has become characterized by strength, speed, and high technical performance, as they are accomplished in a group and individual form with a high degree of understanding and mastery, and in order to achieve this level, it has been necessary to know the correct way and determine the appropriate means and content according to what the matches require. In light of this, the player is prepared from a young age with the quantity and quality that qualifies him to be a player with skill and tactical competence that enables him to accomplish individual and group duties and quickly make decisions at the appropriate time throughout time. The Match (Hussein Al-Sayyid Abu Abdo 127), 2002. Physical requirements are also the basic foundation on which the concept of physical fitness for football players is built, and maximum aerobic speed is one of the most important physical fitness requirements that

a football player needs. The quality of top air speed seen from all angles is an essential criterion in top-level football. In fact, the more football develops, the more we notice players' explosive features.

Modern sports training in football:
Training is defined as “all processes that include building and developing physical fitness elements, learning technique, tactics, and developing mental capabilities within a programmed and purposeful scientific curriculum subject to educational foundations with the aim of bringing the athlete to the highest possible sporting levels.” (Succar, 2002, p. 09). Muhammad Allawi defines it as “an organized educational process that is subject to scientific foundations and principles, and aims primarily to prepare the individual to achieve the highest possible athletic level in sports competitions or in a specific type of sport” (Allawi, 2002, p. 17).

Definition of search terms:
Football: It is a team sport played between two teams, each consisting of eleven players, played with a ball. Football is played on a rectangular field with two goals on either side of it. The match ends after 90 minutes. The goal of the game is to score goals by placing the ball inside the goal, as the team The one who scores the most goals is considered the winner. All of this is done according to the rules of the game.
Age group (under 17 years):

Terminology: The period of adolescence is the stage of transition from childhood (the stage of preparation for adolescence), that is, the stage of adulthood and maturity. Accordingly, adolescence is a stage of preparation for the stage of adulthood (Fakher Aqil, p. 115, 1980). Procedurally: They are players who belong to an age group specified by the Ministry of Youth and Sports.

Training program:
The program in general is one of the elements of the planning process to achieve the goal of the established plan. In order to understand the program and planning in the sports field, and before we explain this relationship, we must understand each part of this relationship separately. The plan, as Abdel Hamid Sharaf defines it, is a general framework that defines the main features. For any project, it represents the basic foundation for it so that it becomes clear what is required to be implemented, provided that it has clear-cut goals. As for Abdul Karim Darwish, he believes that the plan means a set of decisions that define the general framework of a specific project accompanied by specific goals, an appropriate implementation method and a framework. General timing (Amrullah al-Bisati, p. 234).

Maximum aerobic speed (VMA):
It is the speed at which an athlete can consume the maximum oxygen (VO2max), and it is variable from one test to another, as it is considered a real indicator for training programming and planning, as it allows the team to be classified into groups according to the maximum aerobic speed for each athlete, thus achieving the principle of individuality in training (408.p. 2008). .DELLAL).

High-intensity interval training:
high-intensity interval training is the second method of interval training and is considered one of the most important training methods that work to develop the general and specific physical qualities that pertain to each activity and in light of the individual’s maximum energies. High-intensity interval training is characterized by increased training intensity and relatively low volume. The coach aims to use this type of training to develop special endurance (speed endurance, strength endurance, performance endurance) and the strength distinguished by speed and agility in the athlete. High-intensity interval training is also characterized by working under conditions Oxygen debt, that is, working with insufficient oxygen as a result of using maximum intensity during training.
The intensity used here reaches (115%) of the maximum ability of the athlete, but the volume of exercises must be proportional to the intensity used. But in general, the volume should be small due to the high intensity. As for rest, it is necessary to return to the heart rate as a real criterion for using rest. In all cases, the rest period must not exceed (160 seconds) or when the heart rate reaches (120-130 beats per minute), after which the athlete begins performing the other exercise, and it must not The heart rate decreases below this limit for fear of returning to a state of complete recovery (i.e. the heart rate returning to what it was before the start of the exercise) (Muhannad Hussein Al-Bashtawi and Ahmed Ibn Rahim Al-Khoja , p. 11).

Previous and similar studies:
1. Study of Nahal Abdullah (2022) – Algeria: Entitled: "The effect of a medium-length training cycle using the high-intensity interval training method on developing speed endurance among football players under 19 years old". Using the experimental method with two groups, the results showed statistically significant differences in favor of the experimental group, confirming the effectiveness of this method in developing speed endurance.

2. Study of Choufouf Hamza and Nimroud Bachir (2021) – Algeria: Entitled: "The effect of continuous circuit training with plyometric exercises on explosive strength and the development of maximum aerobic speed (VMA) among football players under 17 years old". The results showed significant improvements in VMA, supporting the use of modern training methods with players of the same age category as our study.
3. Study of Boumdine Qadda and Kassem Abdelhadi – Algeria: Entitled: "A comparative study between long-duration and short-duration interval training in developing the maximum aerobic speed (VMA) of football players". The study identified the more effective form of interval training for developing VMA among football players.
4. Study of Seddiki Belal (2021) – Algeria: Entitled: "The effect of interval training and small-sided games training on maximum aerobic speed and motor speed among football players". The results confirmed the effectiveness of interval training in developing VMA.
5. Study of Jamil Khader Ali (2008): Entitled: "The effect of interval and continuous training on developing aerobic endurance and recovery speed among young football players". The results showed statistically significant differences in the post-tests in favor of the interval training group.
6. Study of Faude et al. (2014) – Germany: A cross-over trial with high-level youth football players comparing high-intensity interval training with high-volume running. HIIT achieved comparable endurance improvements with substantially less training time.
7. Study of Clemente et al. (2021) – Portugal: A systematic review with meta-analysis published in the Journal of Sports Sciences, concluding that HIIT is an effective and time-efficient method for improving the aerobic fitness of soccer players.

Comment: The findings of earlier research demonstrate that high-intensity interval training is a successful training strategy for increasing aerobic capacity in soccer players of all ages; the majority of these studies also highlighted how beneficial it is in terms of time efficiency when compared to more conventional training techniques. Based on this, the current study proposes a training program that is integrated into the requirements and planning of the weekly training cycle (microcycle) in order to promote maximum aerobic speed (VMA) in under-17 football players competing in the Algerian championship.

The applied aspect of the study:
The method followed in the research: In light of the nature of the research, its variables, and its purpose, the experimental method was used to suit the nature of the study, as it is defined as a deliberate and controlled change of the specific conditions of a specific reality or phenomenon that is the subject of the study, and then observing what results from this change in that phenomenon (Al-Kandajili, p. 148, 2013). Fields of study: • Human field: The study was conducted on two teams belonging to the second division of amateur football east, category under 17 years, where the team of the sports club of the municipality of Teleghma represents the experimental sample, while the Mouloudia Constantine team represents the control sample. • Spatial field: The spatial domain in the municipal stadium is represented by the martyr Khabaza Bashir, Teleghma.

Time domain:
The proposed training program is applied during the return period from the National Youth Elite Championship, Group Four. Description of the study sample: Table.01 represents the distribution of individuals in the research sample, represented by the experimental sample (Teleghma Club, category under 17 years), to which we applied the experimental program (high-intensity interval training method), and the control sample, represented by (MC Constantine, category under 17 years).

Table (01): Shows the distribution of the research samples (experimental and control), the training method applied to each sample, and the number of players in each group.

Sample	Training method	Number
Experimental (NRBTeleghma)	proposed program (high-intensity interval training method)	20
Control (MOConstantine)	Other method	20

(Source: prepared by the researchers based on the field study data, 2022)

Training program:
In building the program, we relied on scientific standards by browsing everything related to the subject of the research from previous and similar studies, as well as taking into account the opinions of specialists in the field, including trainers and physical trainers. It was decided to program one training session per week using the method of high-intensity interval training. Field tests: After scanning the reference books, magazines, research and studies similar to the research to identify

the most important basic physical requirements in the sport of football; Then a reference survey to identify the most important basic tests for measuring maximum aerobic speed. We chose the Yoyo Intermittent Recovery Test.

Statistical methods used: The test results were transcribed and analyzed using the statistical analysis program SPSS V.22 (Statistical Package for the Social Sciences) The statistical test used is T test

Table (02): Shows the homogeneity of the two groups in the variables (height, weight) and the pre-test for both groups.

Variables	Unit of measurement	Experimental group		Control group		Sig	Significance
		M	Standard deviation	M	Standard deviation		
Height	m	1.71	0.0832	1.73	0.0516	0.36	Not significant
Weight	Kg	61.60	7.74	65.40	5.08	0.09	Not significant
Pre-test	km/h	14.00	0.66	14.86	0.78	0.00	Significant

The significance level is (0.05) and the degree of freedom is (38).

From Table.2, the probability value (sig) ranged between (0.36 and 0.09) for height and weight, respectively, and they are all greater than the significance value $\alpha = 0.05$. This indicates that there are no statistically significant differences between the experimental and control groups in the variables (Height and weight) This means that the two groups are equal, and therefore the sample is homogeneous.

For the pre-test, we note that the probability value (sig) is (0.00), which is less than the significance value $\alpha = 0.05$, and this indicates that there are statistically significant differences for the pre-test between the two samples (control and experimental), but in a weak percentage. This is in favor of the control group.

Table (03): Shows the significance of the differences between the pre-test and post-test for the control group.

Variables	Unit of measurement	Pre-test		Post-test		Sig	Significance
		M	Standard deviation	M	Standard deviation		
VMA	km\h	14.86	0.78	14.95	0.58	0.29	Not significant

The significance level is (0.05) and the degree of freedom is (19).

From the above table, it becomes clear to us that the values of the arithmetic mean for the pre-test are slightly less than the value of the arithmetic mean for the post-test. It is also clear to us from the table that the value of the sig is (0.29), which is greater than the significance level $\alpha=0.05$. This means that there are no statistically significant differences between the pre-test and the post-test for the control group.

Table (04): Shows the significance of the differences between the pre-test and post-test for the experimental group.

Variables	Unit of measurement	Pre-test		Post-test		Sig	Significance
		M	Standard deviation	M	Standard deviation		
VMA	km\h	14.00	0.66	15.55	0.75	0.00	Significant

The significance level is (0.05) and the degree of freedom is (19).

From the above table, it becomes clear to us that the value of the arithmetic mean for the post-test is greater than the value of the arithmetic mean for the pre-test. It is also clear from the table that the value of the (Sig) is (0.00), which is less than the significance level $\alpha = 0.05$. This means that there are statistically significant differences between the pre-test and the post-test for the experimental group, in favor of the post-test.

Table.05 Table (05): Shows the significance of the differences between the post-tests of the two groups (control and experimental).

Variables	Unit of measurement	Control group		Experimental group		Sig	Significance
		M	Standard deviation	M	Standard deviation		
VMA	km\h	14.95	0.58	15.55	0.75	0.01	Significant

The significance level is (0.05) and the degree of freedom is (38).

From the above table, it becomes clear to us that the value of the arithmetic mean for the post-test for the experimental group is greater than the value of the arithmetic mean for the post-test for the control group. It is also clear to us from the table that the value of the sig is (0.01), which is less than the significance level α = 0.05, and This means that there are statistically significant differences between the two post-measurements of the two groups (control and experimental), which are in favor of the experimental group.

2. DISCUSSING THE RESULTS OF THE HYPOTHESES:

a) Presentation and discussion of the results of the first hypothesis: which states that:

There are statistically significant differences between the results of the pre- and post-tests of the control group, which are at the significance level α = 0.05. When observing the results of the tests in the Table.03. for the control group, we find that the results of the pre-test and the post-tests did not show statistically significant differences between the two tests. This is due to continuity and perseverance in the training process in the traditional way, as in the return phase of the tournament, the coach neglected to develop the maximum aerobic speed index. and maintain the same rate for this indicator. Hence, we conclude that the first hypothesis was not fulfilled, and this is what is interesting. We also conclude that the traditional program that cares about the physical aspect can.

b) Presentation and discussion of the results of the second hypothesis: which states that:

There are differences of statistical signification between the results of the pre-test and the post-test for the experimental group, which are in favor of the post-tests at the significance level α= 0.05. It is clear to us from the Table.04 for the experimental group that the results of the tests showed statistically significant differences between the post-test and the pre-test. We attribute the reason for this good improvement in the physical aspect among the members of the experimental sample to the use of the high-intensity interval training method with gradual provision of training loads and taking into account The basic principles of sports training have made an effective contribution to improving the maximum aerobic speed index, and the improvement appears clearly with a good percentage in the results of the post-test. Hence, we confirm the validity of the second hypothesis. There are statistically significant differences between the pre- and post-measurements of the experimental group, which are in favor of the post-test. From this we conclude that the high-intensity interval training method had a positive impact on the development of the maximum aerobic speed index among football players under 17 years of age. The results reached are consistent with the study of Nahal Abdullah 2022 on the use of the high-intensity interval training method in developing speed endurance, with differences between the two groups in favor of the experimental group.

c) Presentation and discussion of the results of the third hypothesis: Which states that:

There are statistically significant differences between the results of the post-tests of the two groups, which are in favor of the post-tests of the experimental group at the significance level α = 0.05. When observing the results of the post-test measurements in Table.05 for the two groups, we find that the results of the post-tests showed statistically significant differences between the two groups, which are in favor of the post-tests of the experimental group. This is due to the effectiveness of the proposed training program based on the high-intensity interval training method in developing the speed index. Maximum aerobic speed and improving the performance of players (experimental group) and by following the sound training methodology by following the correct modern foundations in modern sports training, including the codified and proposed experimental program based on the method of high-intensity interval training, has a positive impact in developing the maximum aerobic speed index for football players. Under 17 years old, because it is a modern scientific method. This is consistent with the results of Jamil Khader Ali's 2008 study, which aims to identify the differences between the use of interval training and continuous training to develop aerobic endurance and speed of recovery recovery in the preparation stage for young football players, which concluded that there are statistically significant differences for the post-test for the two groups, and they are in favor of Experimental group. From here, we confirm the validity of the third hypothesis, including the proposed program based on the method of high-intensity interval training, which has a positive impact on developing the maximum aerobic speed index for football players under 17 years of age, and that there

are statistically significant differences between the two groups in the post-measurements, which are in favor of the post-measurements of the experimental group.

General conclusion:
Within the limits of the objectives, hypothèses, and the sample of the study, and through the results obtained after performing the necessary statistical processing of data, we reached the following conclusions:

CONCLUSIONS:

1- The proposed training program using the high-intensity interval training method has a positive effect on developing the maximum aerobic speed index for football players under 17 years old.
2- The high-intensity interval training method achieved an excellent positive effect on developing the maximum aerobic speed index among members of the experimental group, unlike the old traditional program that most trainers rely on.

Suggestions and recommendations:
In light of these results, we suggest the following:
1- Adopting the high-intensity interval training method in training programs for young players (under 17 years old) to develop maximum aerobic speed.
2- Urging coaches and physical trainers not to rely solely on traditional methods when developing maximum aerobic speed.
3- Conducting similar studies on other age categories (under 15, under 19, and seniors) to verify the effectiveness of this method.
4- Conducting future studies combining the high-intensity interval training method with the development of other physical elements such as speed endurance and explosive power.
5- Encouraging coaches to use field tests (such as the Yo-Yo Intermittent Recovery Test) to periodically estimate maximum aerobic speed in order to adjust training loads accurately.

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Appendices

A. Training program

	Samedi J-6	Dimanche j-5	Lundi j-4	Mardi j-3	Mercredi j-2	Jeudi j-1	Vendredi j
		80-90’	90-100’	80-90’	65-75’		
Micro-cycle 1	Congé	- Mise en forme - Aérobie-course (70-75 %VMA) - Force - TE-TA - Jeu	- TE-TA (jeu 8*2) - Intermittent (8*1 min + 1min recup) -6*1min-1min recup - Jeu 8*8	TE-TA -Pliometre -Jeu(défense de zone) - Jeu libre orienté - vitesse de réaction	- Jeu cognitif -vitesse de reaction -TE-TA Bloc team -Organisation	Congé	**Match**
Micro-cycle 2	Congé	-Aérobie coordination. -Force général. -TE-TA. Jeu de transition -jeu libre.	TE-TA(jeu 4*2) -Intermittent (4*4min +3min recup active) - Jeu (Transition de cote deffensif au cote offenssif)	-TE-TA. - Rando(4*4+3) -endurance de vitesse -jeu en zone de surface(60*40m)	-TE individuelle (contrôle, jeu tete, passe longue) -Jeu -Vitesse de reaction	Congé	**Match**
Micro-cycle 3	Congé	-Aerobie TE-TA. -Jeu(3 equipes de 4 + 2 jokers) -Force (tronc) -jeu	TE-TA(randos 4*2) - Intermittent(2*6*30s/30s recup) - jeu	TE-TA(randos 4*2) -randos (transition offensive – deffenssive) Jeux oriente	- Tir au but - corners(Marquage /démarquage) - vitesse de reaction.	Congé	**Match**
Micro-cycle 4	Congé	-footing oxygenation -Jeu -force (stabilisation) -tennis ballon	--Jeu(5*5) -Intermittent (6*2 min + 2 min recup active) - jeu(3*3+3) - Match	- TE-TA de base -Vitesse demarrage -TE (contrôle de balle) - Tir au but -Jeu	-TE individuel(passe,contrôle,passe longue) -TA(Bloc team -Vitesse de reaction	Congé	**Match**

Jour	Samedi J-6	Dimanche j-5	Lundi j-4	Mardi j-3	Mercredi j-2	Jeudi j-1	Vendredi j
		80-90’	~~80-90’~~	~~90-100’~~	~~65-75’~~		

Micro-cycle 1	Congé	- Mise en forme - Aérobie-course (70-75 %VMA) - Force individuelle - Jeu	- TE-TA (jeu) - Intermittent 5 *800 m + 140s rep) - jeu (5contre5) - jeu 11 contre 11	TE-TA -circuit de force -Jeu(défense de zone) - Jeu libre orienté	- TE(passe+ longue+ contrôle….) -vitesse de demarrage -TE-TA (Attaque rapide) -Organisation	Congé	**Match**
Micro-cycle 2	Congé	-TE-TA(forme joué). -Force général.. -Jeu posé en team -jeu libre.	- TE-TA(jeu 4*2) -Intermittent (10 * 400 m + 90 s rep) - Jeu (8contre8) - jeu libre	- TE-TA. -jeu(4*4) -TE-TA(Orientation du jeu/transition) -vitesse d'acce -jeu libre	-TE individuelle (contrôle, jeu tete, passe longue) -Jeu -Vitesse de reaction	Congé	**Match**
Micro-cycle 3	Congé	-Aerobie TE-TA. -Jeu(3 equipes de 4 + 2 jokers) -Force (tronc) -jeu	- TE-TA(randos 4*2) - Intermittent(15 * 200 m + 80 s rep) - jeu	TE-TA(randos 4*2) Randos 5vs 5 plus 4 Pressing a la perte jeux	- Tir au but - corners(Marquage /démarquage) - vitesse de reaction.	Congé	**Match**
Micro-cycle 4	Congé	-footing oxygenation -Jeu -force (stabilisation) -tennis ballon	- Jeu(5*5) -Intermittent (12*30s sprint + 30 s recup active) - jeu(3*3+3) - Match	- TE-TA de base -Vitesse demarrage -TE (contrôle de balle) - Tir au but -Jeu	-TE individuel(passe,contrôle,passe longue) -TA(Bloc team -Vitesse de reaction	Congé	**Match**