

## The effect of a proposed training program with plyometric exercises on the development of maximum speed and its relationship to (MAS) in football.

<sup>1</sup>Aboura Rabah ; <sup>2</sup>Si larbi Charef

<sup>1,2</sup> STAPS. Univ El-Wancharissi Tissemsilt, Algeria,

<sup>1</sup> aboura.rabah@cuniv-tissemsilt.dz ; <sup>2</sup> silarbic@yahoo.fr

### ARTICLE INFORMATION

Original Research Paper

Received: 14/01/2021

Accepted: 29/04/2021

Published: 01/06/2021

### Keywords:

Plyometric exercises.

Maximum speed.

(MAS) maximum aerobic speed.

Football.

Corresponding author:

Aboura Rabah.

E-mail :

aboura.rabah@cuniv-tissemsilt.dz

### Abstract

Each coach seeks to apply the best training methods to achieve his goals, especially if it comes to the physical requirements of a football player, and this is what our study aims to by identifying the effectiveness of plyometric training in developing the maximum speed and the reflection of its results on the (MAS) and overcoming the problem of time shortage for players.

For this purpose, we used the experimental method on a sample of 18 under-17 players from Village Moussa Football Team in Jijel 2018-2017 season by designing one experimental group with a pre and posttest using different physical tests. The training program was applied in 8 weeks. After processing the data statistically, it was found that there were statistically significant differences up to 0.05 which indicates that the plyometric training has improved the maximum speed and had a positive reflection on the results of the (MAS).

Based on their results, the two researchers recommend the use of plyometric training as it works to develop maximum speed and (MAS) at the same time.

## I. Introduction

Modern training has gone beyond the realm of tradition to employ all the scientific achievements, and its results has exceeded what was not imagined. Records have been broken, performance levels have risen and it approached the ideal in its techniques and skills. Therefore, there were many and varied methods and styles of training in training programs according to the principles and scientific foundations.

Plyometric training is one of the most important modern training methods, which are exercises that carry the muscle while it is in a state of stretching(eccentric), and it is followed directly by a central contraction (concentric) (Theodore, 2010, p. 05) as it has become one of the most popular training methods for all levels and ages and a suitable method for a wide range of Sports activities (Shenouf & Nasir, 2017, p.91) and has great importance in improving muscle strength, and it works to develop anaerobic capabilities and physical abilities, and more precisely, plyometric exercises train the muscles to shift rapidly from eccentric contraction to concentric contraction and vice versa during specific moments of time ( Talha Hussam El-Din et al., 1997, p. 78). It also contributes effectively to increasing the efficiency of fast muscle fibers, which develops in the player the characteristic of speed and explosive force (Bouhaj & Risham, 2018, p. 220) and thus improving the respiratory periodic endurance and in the beginning of preparation period helps to improve the characteristic strength With speed, the element of speed, and the endurance of speed (Shady & Bashir, 2019).

In view of what we have mentioned above about what can be achieved with plyometric training, strength, maximum speed and the ability to combine them together has become the new determinant or guide in training programs to improve the physical and skill levels of football players, especially the younger youth groups (Draghi & Mazari, 2020, p. 98).since the Footballer runs, passes, shoots, resists and changes its place constantly, This is what made modern training moves towards the peculiarities of the game (El-Antari et al., 2020, p.68).

In football, speed is the main component in performance as an effective characteristic in the fitness system of football players (Lambertin, 2000, p14) and one of the signs that distinguish any player from another player, and it is also considered one of the determinants of his footballing future (Bukratum & Medani, 2019, p. 236) and the speed of the football player for Fynek is a very diverse ability, it does not only include (the

## The effect of a proposed training program with plyometric exercises on the development of maximum speed and its relationship to (MAS) in football.

---

ability to act and respond quickly, start and run quickly, handling the ball, speed of launch and stopping) to include the speed of analysis and exploitation of situations (Dellal et al., 2008, p62), and in view of the numerous studies on the existence of a relationship between speed and aerobic abilities as a study (Draghi & Mazari, 2020, p. 99) that the player should possess respiratory capabilities because it is the basis for developing anaerobic abilities. Speed is the most important characteristic because it represents the qualitative action (Bensalem et al., 2020, P14). In the aerobic field, knowledge of the (MAS) Maximum Aerobic Speed is essential, it is the speed at which the maximum oxygen consumption is reached (Lambertin, 2000, p48).

On this basis, we raise the following question: Does the training program for plyometric exercises has a positive effect on the maximum speed and its relationship to the maximum aerobic speed of under 17 football players?

### 1.1. Literature Review:

Based on our field experience as trainers, we noticed an improvement in (MAS) as a result of training to develop speed with plyometric exercises. In addition to reviewing many previous and similar studies which have indicated the importance of plyometric training in developing the maximum speed or its constituent elements such as explosive force, lower limb strength, power, and aerobic capacity for athletes as a study (Draghi & Mazari, 2020), which is the closest to Our research in terms of the effect of plyometric exercises and the relationship between The maximum speed and maximum aerobic speed. The study was conducted on a sample of 36 players from two different teams, where the two researchers concluded that the plyometric training had a positive role in raising the muscular capacity by improving the force characteristic of speed and explosive force, and it also had a positive effect in increasing the maximum aerobic speed rates of football players is cubs. Therefore, the researchers suggested using this method as it develops more than one physical characteristic at the same time, confirming the study of (Mokkedes Moulay, 2018) about the importance of plyometric training in the physical preparation of young female football players. On a sample of 26 players with a control group and another experimental group, the researchers concluded the importance of training the plyometric from the

physical side and improving aerobic abilities as well as avoiding injuries, in addition to the study of (Taheri & Abura, 2020). which suggested using the method in plyometric training to develop the distinctive strength of speed among female wrestlers with a sample of 8 wrestlers. The two researchers found that the force characterized by speed was developed using plyometric exercises, as for the study (Roweny, 2020) on the effect of using ballistic exercises in training plyometric to develop power of the explosbs lower among soccer players, the study was conducted on 24 U19 players, and after achieving the results, the two researchers recommended using ballistic exercises in plyometric training, which is adding weights during plyometric exercises by 30% to 50% of the maximum weight that can be carried to develop the explosive strength of the lower limbs of a football player's foot. Based on the literature review, we assume that the proposed training program is affected by plyometric exercises in developing the maximum speed and the development of the maximum aerobic speed as a result of that for football players under 17 years old.

## II. Method and Materials :

- **Participants :**

The research community in this study was represented in 16 football teams under 17 years old and active in the second section of amateurs - eastern football, and given the nature of our research, a sample was intentionally chosen from the team of Village Musa (CRVMJ) 2017/2018 season, who are 18 players under 17 years old, taking into account Homogeneity of the sample.

*Table 1: shows the homogeneity in the variables (age, height, weight, training age).*

Variable	Unit	Arithmetic mean- $\bar{x}$	Standard deviation- S	Coefficient of Variation- CV
<b>Length</b>	M	1.69	0.009	0.53%
<b>Weight</b>	Kg	64.16	1.29	2.01%
<b>Age</b>	Years	16.5	0.54	3.11%
<b>Training age</b>	Years	7.83	0.80	10;26%

Since the coefficient of variation for all variables does not exceed 15%, this indicates that there is great homogeneity within the sample in terms of variables (height, weight, training age, age).

\* **Research Curriculum:** The two researchers used the experimental method using one group (experimental group) by performing a pre and post measurement.

## The effect of a proposed training program with plyometric exercises on the development of maximum speed and its relationship to (MAS) in football.

\* **Independent Variable:** Plyometric Training.

\* **The dependent Variables:** They are Maximum Speed and Maximum Aerobic Speed.

• **Materials :**

In order to find solutions to the problem and validate the research hypotheses, the most effective methods and tools must be followed through study and examination, and thus will be based on the following tools:

\* **Theoretical study (bibliographic analysis):** Represented by Arabic and foreign sources and references, including books, notes, dictionaries, magazines and the Internet... The aim is to create a theoretical background that will help the researchers complete the field study.

\***The training program:** The program was implemented in 8 weeks, with two sessions per week, during the special preparation period, in which the progression in the levels of the three plyometric exercises was taken into account: low-intensity (jumps without tools), moderate-intensity (with boxes and ropes), high-intensity using various tools with the ball.

*Table NO 2: Shows the weekly training program*

	low-intensity				moderate-intensity		high-intensity	
EXERCISE	WEEK1	WEEK2	WEEK3	WEEK4	WEEK5	WEEK6	WEEK7	WEEK8
Squat jump	3*7	3*7	3*10					
Tuck jumps	3*7	3*7	3*10	3*10				
Bounding with rings	2*10	2*10	3*7	3*10				
-JUMP TO BOX					3*10	3*12	4*10	4*12
Single leg lateral hops	3*7	3*10	3*10	3*10				
Depth jumps					3*10	3*12	4*10	4*12
Medicine Ball Push Up					3*10	3*12	4*10	
Lateral hurdle jump					3*10	3*12		4*10
burpees				3*10			4*10	4*12
Double leg hardel jump	3*7	3*10	3*10	3*10				
One leg hardel jump					3*10	3*12	4*10	4*12

\***Physical tests:**

- **40m Sprint Test:** The test involves running a single maximum sprint over 40 meters, with the time recorded. A thorough warm up should be given,

including some practice starts and accelerations. The players start from a stationary position, with one foot in front of the other. The front foot must be on the starting line. The players should be stationary prior to starting. As the arm sweeps down, the tester should start the stopwatch which is held in the downward sweeping arm, and finish the stopwatch as their chest passes through the finish line.

- **Test last 20m from a distance of 40m:** The tester stands at a distance of 20 m to give a signal when the player passes the second tester to turn on the stopwatch and calculate the remaining 20 m time, which expresses the maximum speed of running without the influence of the explosive force of the Starting.

- **10 x 5m Shuttle Test:** is a measure of speed and agility, and is part of the Eurofit Testing Battery. Participants run back-and-forth over 5 meters, for a total of 50m. this teste requires stopwatch, measuring tape, marker cones, a flat non-slip surface. marker cones and/or lines are placed five meters apart. Start with a foot at one marker. When instructed by the timer, the subject runs to the opposite marker, turns and returns to the starting line. This is repeated five times without stopping (covering 50 meters in total). At each marker both feet must fully cross the liner. The tester records the total time taken to complete the 50 m course.

- **6 Minute Run Test:** The six minute run test has been developed as a shorter alternative to the 12 minute Cooper run test. The plyers must run for six minutes attempting to cover the maximum distance possible in that time. The purpose of this test is to test aerobic endurance fitness (the ability of the body to use oxygen as an energy source). After finding the distance traveled in 6minutes , we convert the units to (km and hour), then we divide the distance by time to find the maximum aerobic speed (MAS).

**\*The scientific foundations of the tool:**

*Table No 3: represents the reliability and validity factor of the physical tests*

Physical Tests	Statistical study	Exploratory Sample	Validity Coefficients	Reliability Coefficients	Significance level
Aerobic capacity test	6Minut Run Test	05	0.98	0.99	0.05
maximum speed tests	40m Sprint Test	05	0.98	0.99	0.05
	Test last 20m from a distance of 40m	05	0.98	0.99	0.05

It is evident from the table that the physical tests have a high validity and stability coefficient greater than 0.5, and therefore they are suitable for study.

## The effect of a proposed training program with plyometric exercises on the development

### of maximum speed and its relationship to (MAS) in football.

### 2.3. Statistical Analysis :

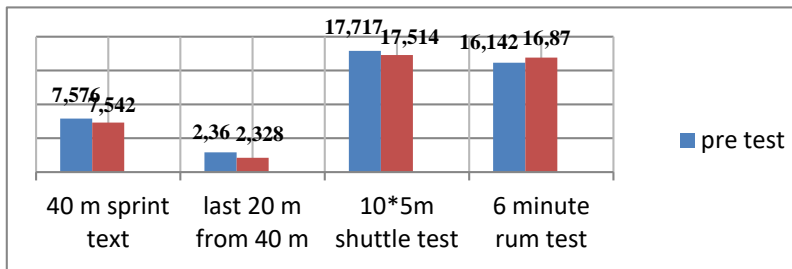
The researchers used several statistical methods, including: Percentages, Arithmetic Mean, Standard Deviation, Student Test T, Coefficient of Variation(CV) and the use of the statistical package system (SPSS): (IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp).

### III. Results:

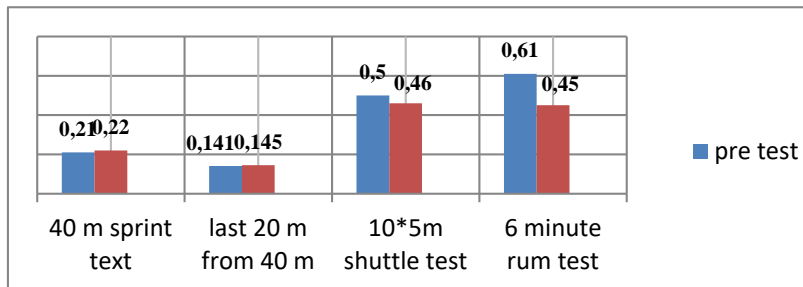
\* Display and analysis of the results of pre and post physical tests for maximum speed.

*Table No 04: shows the results of the pre and post test for the physical Tests.*

test	Pre		Post		Calculated T	T table	sig	Df
40m Sprint Test	— x	S	— x	S	9.58	2.10	0.05	17
	7.57	0.21	7.54	0.22				
last 20m speed test of the 40m	— x	S	— x	S	8.22	2.10	0.05	17
	2.36	0.141	2.32	0.145				
shuttle test 10 X 5m	— x	S	— x	S	6.76	2.10	0.05	17
	17.71	0.50	17.51	0.46				
six minute run test	— x	S	— x	S	8.87	2.10	0.05	17
	16.14	0.61	16.87	0.45				



*Diagram 1:arithmetic mean of the pre and post test of the physical text*



*Diagram 2:standard deviation of the pre and post test of the physical tests*

## Analysis of the results

40 m Sprint Test: it becomes clear to us that the arithmetic mean in the pre-test is 7.57 s and the standard deviation is 0.21, while the arithmetic mean of the post test was 7.54 s and the standard deviation 0.22 after calculating T at the degree of freedom (N-1) and the level of significance  $\text{sig} = 0.05$  and we found it 9.58, and compared to the tabular T which equals 2.10, we find that the tabularity is less than the calculated one, which indicates that the results are statistically significant and that there are significant differences in favor of the post test.

Last 20 m of 40 m test: it becomes clear to us that the arithmetic mean in the pre-test is 2.36 s and the standard deviation is 0.141, while the arithmetic mean of the post test was 2.32 s and the standard deviation is 0.145 and after calculating T at the degree of freedom (N-1) and the level of significance  $\text{sig} = 0.05$  and We found it 8.22, and compared to the tabular T equal to 2.10, we find that the tabular is less than the calculated one, which indicates that the results are statistically significant and that there are significant differences in favor of the post test.

Shuttle Test 10\*5 : it is clear to us that the arithmetic mean in the pre-test is 17.71 s and the standard deviation is 0.50, while the arithmetic mean of the post test was 17.51 s and the standard deviation is 0.46 and after calculating T at the degree of freedom (N-1) and the level of significance  $\text{sig} = 0.05$  and we found it 6.76, and compared to the tabular T which equals 2.10, we find that the tabularity is less than the calculated one, which indicates that the results are statistically significant and that there are significant differences in favor of the post test.

6 minutes Run Test: it is clear to us that the arithmetic mean in the pre-test is 16.14 km / h and the standard deviation is 0.61, while the arithmetic mean of the post test was 16.87 km / h and the standard deviation is 0.45 after calculating T at the degree of freedom (N-1) and The level of significance  $\text{sig} = 0.05$  and we found it 8.87, and compared with the tabular T which is equal to 2.10, we find that the tabularity is less than the calculated one, which indicates that the results are statistically significant and that there are significant differences in favor of the post test.

## IV. Discussion:

Through the statistical treatment of the results of the maximum speed tests, it becomes clear that there are statistically significant differences in



## The effect of a proposed training program with plyometric exercises on the development of maximum speed and its relationship to (MAS) in football.

favor of the post-tests, and this is what the results show in Table (4). we find statistically significant differences at a significance level of 0.05 between the pre and post tests in favor of the post tests. This is naturally due to the training program with plyometric exercises, which had an effect on the maximum speed, whether and maintaining it for a distance From this distance, 40 meters are important and one of the requirements of football players. This is confirmed by the study of (Bin Quwah et al., 2011) and (Belayneh C-A, 2020) that plyometric exercises work to develop the maximum speed in the 30-meter test of speed with the ball and without the ball, and from the same table we find statistically significant differences at a level of significance 0.05 between the pre and post tests in favor of the post tests. This is, of course, due to the training program with plyometric exercises, which had an effect on the speed of changing direction, which is an important characteristic for offensive and defensive players in football This is due physiologically to the fact that the functional and physiological principle of the muscle stretching process is based on the hypothesis that the greater the speed of muscle stretching, the greater the involuntary reflection (Derrise, 1982, p53). It is also a common recommendation and approach to have plyometric exercises in the microcycles of the competition period so as to maintain speed and speed related soccer fitness (Ramirez-Campillo et al., 2015).

And we find in table (4) statistically significant differences at a level of significance 0.05 between the pre and post tests in favor of the post tests and this is naturally due to the direct relationship between the maximum speed and the maximum airspeed, where and after the development of the maximum speed as a result of the training program with plyometric exercises improved The maximum aerobic speed is estimated at a percentage of 4.52%. This indicates that two physical classes can be developed by using plyometric exercises in training programs or by developing and maintaining the Maximu Aerobic Speed MAS and capabilities as well. The two researchers (Helouz & Hanat, 2019) have concluded that The plyometric training leads to the development of the lactacid aerobic capacity and explosive power of 400m runners, and the importance of the aerobic capacity in football is highlighted by being the basis for developing the maximum speed and the ability to repeat velocities and this is what the study (Arkoub, 2020, p79) and the study (Boukratam, 2019) concluded that plyometric training has an effect on rapid, repetitive RSA running and increases the ability to repeat speeds.

## V. Conclusion:

Reaching the achievement of global results in various sports disciplines coupled with preparing training programs according to scientific foundations whose application stands for the coach, who is considered the main focus in the training process for players. Football has stimulated research and scientific work that cannot be underestimated, as it is the first popular sport in the world, and it is specialized in physical requirements that make the difference in the multiple competitions.

Thus the idea of studying the method of developing one of the most important physical characteristics in football started by studying the effect of a proposed training program with plyometric exercises on the development of the maximum speed of football players and its relationship to the maximum aerobic speed and after the systematic work through the scientific methodological sequence in the research beginning with reading and the various studies and scientific researches and theories related to sports training in general and plyometric training, especially in the field of football, the two researchers concluded that plyometric training improves the maximum speed of football players and the maximum aerobic speed, and therefore the two researchers believe that plyometric training is very suitable for those looking to develop characteristic of maximum speed and Aerobic capacity, thus having the difference that makes success.

Due to the reliance of plyometric exercises mainly on the development of strength, and although many studies have achieved their desired goals, we recommend not to use them before warming well for players and arranging plyometric exercises gradually to avoid injuries.

**The effect of a proposed training program  
with plyometric exercises on the development  
of maximum speed and its relationship to (MAS) in football.**

---

**V. References:**

- 1- Al-Antari, M., Ben Rabeh, K ., & Ben Naajah, M. (2020) .The effect of a training program using the interval method and plyometric exercises on some physical variables of U19 soccer players. Journal of Sport Science Technology and physical activities, Mostaganem, 17(1), 67-80.
- 2- Allawi, M. H., & Ratib, O. K. (1990). Scientific research in physical education, sports psychology. Egypt. Arab Thought House Cairo.
- 3- Arkoub, H. (2020). The effect of an intermittent training program on the endurance of football players. journal of sports science and high level training, Algiers 3. 4(1).
- 4- Belayneh Chekle Admassu. (2020). RSA performance gain out of training. International Journal of Health, Physical Education and Computer Science in Sports, 39( 2), 5-11.
- 5- Ben Quwah, A., Ben Qasid, A. A- H. M., & Ben Barno, A. (2011). The effect of a proposed training program for the preparatory period to develop the physical and skills aspects of the football players of the Oran team (Algeria). Journal of Sport Science Technology and physical activities, Mostaganem, 8(8), 207-216.
- 6- Bensalem, S., Hobara, M., & Menella, R. (2020). Comparative study of aerobic and anaerobic alactic work capacity according to the positions occupied among footballers. Journal of Sport Science Technology and physical activities, Mostaganem, 17(1), 13-28.
- 7- Bouhaj, M., & Rasham, J. A-D. (2018). the effect of the plyometric training in the repetitive method on the development of explosive force and the development of the skill of repelling in the cubes of volleyball. Journal of Sport Science Technology and physical activities, Mostaganem, 15(3), 218-239.
- 8- Boukratim, B. (2019). Effects of a plyometric training program on the repeated sprint ability RSA for senior's football players. Journal of Sports Performance Sciences. article/2066. (1). 112-126.
- 9- Boukratim, B., & Medani, M. (2019). The Effects of a plyometric training program on maximal speed and Agility for soccer players Category U19. Journal of Sport Science Technology and physical activities, Mostaganem, 16(2), 235-250.
- 10- Daraji, A., & Mazari, F. (2020). The extent to which a program of biometric training reflects on the muscular ability and maximum aerobic speed of football players. Journal of Sport Science Technology and physical activities, Mostaganem, 17(1), 97-108.

- 11- Dellal, A., Barriou, P., Carlo .C., Chamari, K. & others. (2008). from training to football performance. Brouxelles. Beak.
- 12- Derrise, (1982). physiology of exerices .U.S.A: publisher in the U.S.A
- 13- Frédéric, I. (2000). foot Ball integrated physical preparation. Paris. amphora edition.
- 14- Halouz, H., & Hanat, A. (2019). The effect of bliometric training in repetitive training and high intensity interval training on anaerobic lactic Power and Explosive power of 400 m runner's. Journal of Sport Science Technology and physical activities, Mostaganem, 16(2). 331-344.
- 15- Mokkedes, M. I., Zerf, M., Bengoua, A., & Blidi, T. (2018). Importance of plyometrics in the physical preparation of young female football players (14-17). Journal of Sport Science Technology and physical activities, Mostaganem, 15(2), 48-58.
- 16- Ramírez-Campillo R, Gallardo F, Henriquez-Olguín C, Meylan CM, Martínez C, Alvarez C, *et al.* (2015). Effect of vertical, horizontal, and combined plyometric training on explosive, balance, and endurance performance of young soccer players. J Strength Cond .
- 17- Shady, A. R., & Bashir, H. (2019). Effect of plyometric training by using the interval circular training method on the development of explosive power of the lower limbs of handball players under 19 years. Journal of Sport Science Technology and physical activities, Mostaganem, 16(2), 142-156.
- 18- Shenouf, K., & Nasser, A. k. (2017). The impact of plyometric exercises on the development of the maximum strength and its relationship to the improvement of the technical level of the karate class players. Journal of Sport Science Technology and physical activities, Mostaganem, 17(1), 87-113.
- 19- Talha, H. E-D & others. (1997). The scientific encyclopedia of sports training: strength, ability, bearing strength, flexibility. Egybt. Book Center Publishing, Part 1.
- 20- Theodore, P. translated by Jamal, S. F. (2010). Plyometric strength training to develop maximum strength. Amman. Tigris, 1st Edition.
- 21- Zaidoun., & Jawad, M. J. (2004). The effect of using percentages of the keratin phosphate compound on the development of muscle strength and achievement among the (100) meter runners and the elite. Iraq. Baghdad University.