PSYCHOLOGY AND EDUCATION (2024) 61(8): 52-66
ISSN:1553-6939

Effect of an intermittent training program by comparing between the training types 10''/10'' and 20''/20'' in developing maximum aerobic speed in football players under 19 years old

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Received: 07/2024, Published: 08/2024

Abstract:

This study seeks to understand the effect of different types of intermittent training methods in developing maximum aerobic speed with the aim of determining the extent of impact of two training programs: the first, through the application of the training type "10"/10" straight line running to develop maximum aerobic speed. The second, through the application of the training type "20"/20" shuttle running (back and forth) to develop maximum aerobic speed. After applying both training programs to the two training groups, we found that the training type "10"/10" straight line running had a better effect than the training type "20"/20" shuttle running (back and forth).

Keywords: Intermittent training; maximum aerobic speed; under 19 years.

1. Introduction

Developing the physical aspect of players is of great importance in the training process, and regardless of the types and forms of training, they are directed practical exercises prepared to achieve the training goal in various requirements of the practiced sports activity, whether it is skill-based, strategic, mental, or through the execution of the physical preparation process. The methods and styles of training and preparation to enhance the level of sports achievement have varied, thus it is necessary for the coach to know these methods to choose what fits the training directions. The training method is represented in the organized practical procedure of the selected exercises in light of specific values for the directed training load to achieve a certain goal (Al-Basti, 1998).

The development of training methods is a positive factor, helping the coach improve the athlete's physical efficiency, through attempting to benefit from the best and most effective methods to develop each physical attribute, at the right time according to the requirements of the stage in the competitive season (Dellal, 2022). The intermittent training method is one of the training methods that has gained consensus in the field of physical preparation for the football player especially since the intermittent training through the nature of the physical effort recorded in the competition.

All researchers in the field of physical preparation agree that a player during a football match and according to statistics from various competitions covers a distance ranging between 8-13 km. This distance may increase or decrease depending on the player's role in the team and the game system(Alexandre Dellal, 2008). However, this physical effort has become a series of effort periods followed by rest periods, which encouraged many to choose intermittent training as an effective means of preparing the player. (Bangsbo et al., 2006) analyzed the physical activity during a football match as being intermittent in nature because according to this study, in football matches, a player performs a variety of movements including running forward and backward, walking, dribbling, and speed in different directions (Spinks et al., 2013, p. 53).

Most studies have confirmed that the effort of a professional player during an official match varies between 72-109 explosive running movements, 40-70 stops and changes of direction, 6 interventions to retrieve the ball, 13 dribbles, 11 head strikes, 30 movements without the ball, and 27 movements with the ball. All these data indicated that football is a team game with a predominant physical activity characterized by intermittent effort (Dellal, 2022).

2. The General Framework of the Research Problem

The modern football player, in analyzing the competition in all its aspects and through each position, has revealed the nature of the effort exerted and its precise form. With technological advancements, the approach has come closer to the reality of the physical effort expended during matches, recording new data related to aerobic and anaerobic characteristics increasingly in the distances covered. The performance evolved from covering a distance of 4 km in the 1950s to covering a distance of 10-14 km in a single match with an average heart rate reaching 150-190 beats per minute. There is also a difference in this distance according to playing positions, as many studies and researchers, with (Bangsbo et al., 2006) at the forefront, have pointed out. They noted an intensity of 80-90% of maximum heart rate as a moderate effort intensity of a player during competition, as confirmed by (Stølen et al., 2005), which amounts to 70% of the maximum oxygen volume. This highlights the quantitative data of the type of physical effort, where other analyses showed that during a match, a player repeats efforts of approximately 600 meters exceeding an intensity of 19.8 km/h (Levavasseur et al., 2010). Observers of the Algerian league matches notice the monotony and lack of excitement and thrill due to the absence of such performance numbers as recorded in their European and even Gulf counterparts.

Through the quantitative and qualitative analysis of the modern requirements of a football player, based on what statistics provide, studies by (Bangsbo et al., 2006) concluded that the

activity of a football player is a form of intermittent effort. By this reasoning, and what players provide from repeating efforts of varied and random intensity interspersed with rest periods (Levavasseur et al., 2010), this influenced the development of training methods and hastened the emergence of those that align with the characteristics of this sport, namely the intermittent training method. Through it, according to research (Alexandre Dellal, 2008), it is possible to develop the aerobic aspect qualitatively, taking into account the kinetic nature of football matches.

For general training guidance and physical preparation in particular, the coach needs to know the physiological physical impact that occurs during official matches precisely, and according to different levels of practice. Modern football is characterized by high-intensity play interspersed with periods of low intensity, highlighting the game's discontinuous nature in effort continuity, and classifying it among intermittent sports. (Stølen et al., 2005) sees football as an intermittent sport characterized by repeated explosive efforts. During a match, a player performs 1000 to 1400 activities of short duration ranging from 2 to 4 seconds, including 220 of high intensity. These efforts consist of sprinting, acceleration and deceleration, changing directions, jumping, passing, and shooting.

From the foregoing, we conclude that the best thing to rely on in training and physical preparation, in particular, is the repetition of high-intensity physical efforts of short durations interspersed with rest periods equal to or greater than their counterparts in performance, to direct the training to the reality of the competition and to dispense with methods and means far from the reality of competition in order to achieve the best performance during events and official competitions. Therefore, many specialists have hastened to reconsider the curricula and training methods and adapt them to the real physical requirements resulting from the physical analysis of the sports competition. Given that the physical aspect is one of the most important requirements for the modern football player and intermittent training is one of the most modern methods in training, with many differences in opinions on its real objectives, (Cometti & Cometti, 2012) confirms that this method develops both aerobic and anaerobic capacities. While many studies indicate that intermittent training significantly affects various aerobic and anaerobic capacities together, in the face of this divergence of ideas, the researcher sought to shed light on the intermittent training method to know its impact on developing maximum aerobic speed through posing the following main question:

To what extent do the two training programs by the method of intermittent training through comparing the training type 10''/10'' and 20''/20'' affect the development of maximum aerobic speed in U19 football players during the competition phase?

To facilitate the research and reach accurate results, we divided the question into the following sub-questions:

- Are there statistically significant differences in developing maximum aerobic speed through the training type "10"/10" straight line running between the pre-test and post-test for experimental group 1?

- Are there statistically significant differences in developing maximum aerobic speed through the training type "20"/20" shuttle running (back and forth) between the pre-test and post-test for experimental group 2?
- Are there statistically significant differences in developing maximum aerobic speed between the post-tests for both experimental group 1 and experimental group 2?

3. Research Hypotheses

This study proceeds from the following main hypotheses:

The two training programs using the method of intermittent training through the training types 10''/10'' and 20''/20'' affect the development of maximum aerobic speed in U19 football players during the competition phase.

The following sub- hypotheses fall under this main hypothesis:

- There are significant differences in developing maximum aerobic speed through the training type "10"/10" straight line running between the pre-test and the post-test for experimental group 1.
- There are statistically significant differences in developing maximum aerobic speed through the training type "20"/20" shuttle running (back and forth) between the pre-test and the post-test for experimental group 2.
- There are statistically significant differences in developing maximum aerobic speed between the post-tests for both experimental group 1 and experimental group 2.

4. Research Objectives

The study aims to determine the extent of the impact of the two training programs for the method of intermittent training:

- The first training program: Through the application of the training type "10"/10" straight line running to develop maximum aerobic speed.
- The second training program: Through the application of the training type "20"/20" shuttle running (back and forth) to develop maximum aerobic speed.

5. Research Methodology

The researcher relied on the experimental method as it suits the nature of the posed problem.

6. Research Population and Sample

The research population consists of players from the first professional championship under 19 years old for the 2021/2022 sports season. The research sample was purposively selected and consisted of players from Nasr Hussein Dey, totaling 24 players, divided into two groups:

- 12 players in group 1 trained with the intermittent training method 10"/10" on a straight line.
- 12 players form group 2 trained with the intermittent training method 20"/20" back and forth.

7. Homogeneity and Equivalence of Pre-test Physical Field Tests for Normal Distribution Adequacy (Shapiro-Wilk) for the Research Samples

Table 01: Represents the results of the pre-test field tests for Maximum Aerobic Speed (VMA) for normal distribution adequacy through the Shapiro-Wilk statistical test

Tests	Significance Level Value (SIG)	Shapiro Value	Statistical Decision
VMA	0.063	0.921	Data are normally distributed

Significance level (0.05), degrees of freedom (24), scheduled Shapiro(0.963)

Source: Prepared by the researcher

It is observed that the tests for maximum aerobic speed follow a normal distribution, which is due to the probability values of the pre-tests for:

Maximum Aerobic Speed, amounting to 0.063, which is greater than the significance level of 0.05 at 24 degrees of freedom. Therefore, the researcher concludes that the data follow a normal distribution and proceeds to verify the homogeneity of variance in the data through the Levene statistical test:

Table 02: Represents the results of the pre-test field tests for Maximum Aerobic Speed to verify the homogeneity of the two samples in variance through the Levene statistical test (F)

Tests	Significance Level Value (SIG)	Calculated Levene (F) Value	Statistical Decision
VMA	0.558	0.353	The two groups are homogenous in variance

Significance level (0.05), degrees of freedom V1=1, V2=22, scheduled Levene (F)(4.3009)

Source: Prepared by the researcher

The results of the table clarify that the calculated Levene (F) value in the pre-measurements for maximum aerobic speed, amounting to 0.353, is less than the scheduled Levene (F) value of 4.3009 at the significance level (0.05), degrees of freedom V1=1, V2=22, indicating that the measurements are not significant between individuals of experimental group 1 and experimental group 2. This means that the two groups are homogeneous in variance and the researcher can use parametric tests to identify the statistical differences in the pre-test measurements for the research samples.

8. Homogeneity and Equivalence in Anthropometric Measurements for Normal Distribution Adequacy (Shapiro-Wilk) for the Research Samples

Table 03: Represents the results of the measurements of height, weight, and waist circumference to verify the normal distribution adequacy through the Shapiro-Wilk statistical test

Tests	Significance Level Value (SIG)	Shapiro Value	Statistical Decision
Height	0.177	0.942	Data are normally distributed
Weight	0.057	0.919	Data are normally distributed
Waist Circumference	0.157	0.939	Data are normally distributed

Significance level (0.05), degrees of freedom (24), scheduled Shapiro(0.963)

Source: Prepared by the researcher

The table shows that the measurements of height, weight, and waist circumference follow a normal distribution, which is due to their probability values estimated at: (0.177/ 0.057/ 0.157) respectively, which are thus greater than the significance level of 0.05 at 24 degrees of freedom. Also, in terms of the Shapiro value calculated in all completed measurements for being greater than the scheduled Shapiro value, the researcher confirms that all data follow a normal distribution and proceeds to verify the homogeneity of variance in the data through the Levene statistical test:

Table 04: Represents the results of the measurements of height, weight, and waist circumference to verify the homogeneity and equivalence of the two samples based on the Levene statistical test (F)

Tests	Significance Level Value (SIG)	Calculated Levene (F) Value	Statistical Decision
Height	0.307	1.092	The two groups are homogenous in variance
Weight	0.639	0.289	The two groups are homogenous in variance
Waist Circumference	0.709	0.144	The two groups are homogenous in variance

Significance level (0.05), degrees of freedom V1=1, V2=22, scheduled Levene (F)(4.3009)

Source: Prepared by the researcher

The results of the table clarify that the calculated Levene (F) value for the anthropometric measurements of: (height, weight, and waist circumference) amounting to 1.092, 0.289, 0.144 respectively, is less than the scheduled Levene (F) value of 4.3009 at the significance level (0.05), degrees of freedom V1=1, V2=22. This indicates that the measurements are not significant between individuals of experimental group 1 and experimental group 2, demonstrating that the two groups are homogeneous and equivalent. This means the researcher can apply the training program and use parametric tests to determine the statistical differences in the measurements for the research samples.

Table 05: Represents the results of the T-Test for the anthropometric measurements for the two experimental groups.

Tests	Unit of Measurement	Research Sample (n=24)				T-Value (-/+)	Probability Value SIG
		Experimental Sample 1		Experimental Sample 2			
		Mean	St.d	Mean	St.d		
Height	(meters)	1.8	0.057	1.81	0.075	-0.21	0.3
Weight	(kilograms)	70.02	8.15	70.08	6.4	-0.019	0.63
Waist Circumference	(centimeters)	76.41	4.85	77.83	3.35	-0.83	0.14

Significance level (0.05), degrees of freedom.(11)

Source: Prepared by the researcher

The results of table number (05), which shows the statistical results for the anthropometric measurements for the research samples, where the probability value (sig) reached 0.3, 0.63, 0.14 for height, weight, and waist circumference respectively, which are greater than the significance level of 0.05. Also, considering the calculated T value of 2.77, which is greater than the tabulated T-test value of 2.201 at degrees of freedom (df=22), we can say there are no statistically significant differences in the anthropometric measurements for the research samples, meaning there is no difference in statistical confidence level and it is not significant evidentially for the T-test for two independent samples, indicating that the samples are homogeneous.

9. Research Tools

In our study, we used physical tests for maximum aerobic speed and then repeated them after seven (7) weeks to determine the immediate effect, including the Léger Shuttle Run Test (NAVETTE) from 1985.

Our study was also conducted on a football field, using a variety of equipment (measuring tape, cones, recording paper, mp4, Biper, etc.). As for the means of collecting information, they consisted of sources and references in both Arabic and foreign languages.

A pilot experiment was conducted to prepare the necessary equipment for conducting the tests and preparing the training program, which was reviewed and approved by a group of experts and specialists in the field of football, as the study is in this area.

10. Definition of Concepts and Terms Used in the Research

10.1 Intermittent Training Method

Conceptual definition: It is the physical effort in which work duration and rest duration alternate, keeping a high level of quality in the efforts made and maintaining a high heart rate (Dellal, 2022).

Operational definition: A training method in which performance and rest alternate, manifested in various forms (intermittent running, intermittent jumping, mixed intermittent...) and three types (long intermittent, medium intermittent, short intermittent).

10.2 Maximum Aerobic Speed

Conceptual definition: It is the speed at which maximum aerobic capacity is reached, indicating the maximum oxygen uptake(Dupont & Bosquet, 2007).

Operational definition: The maximum speed an athlete can achieve at their maximum oxygen uptake.

10.3 Football (Soccer)

Conceptual definition: A popular team sport with widespread popularity played by two teams, each consisting of 11 players and 7 substitutes, with each team attempting to score as many goals as possible to win the match on a flat field, governed by a main referee, two linesmen, and a match commissioner (Darwish, 1984).

Operational definition: A team sport played between two teams of 11 players plus 7 substitutes on a rectangular field, overseen by a referee who ensures the rules are followed, with each team trying to score as many goals as possible to win the match.

11. Homogeneity and Equivalence in Post-test Field Measurements Through Normal Distribution Adequacy (Shapiro-Wilk) for the Research Sample

After applying the pre-test and post-test physical tests for both experimental group 1 and experimental group 2, consisting of a test for maximum aerobic speed (VMA) on the sample of 24 football players under 19 years old from Nasr Hussein Dey team in the first professional league.

Table 06: Represents the results of the post-test field measurements for maximum aerobic speed to verify the normal distribution adequacy through the Shapiro-Wilk statistical test.

Tests	Significance Level Value (SIG)	Shapiro Value	Statistical Decision
VMA	0.052	0.918	Data are normally distributed

Significance level (0.05), degrees of freedom (24), scheduled Shapiro(0.963)

Source: Prepared by the researcher

Through the above table, we notice that the variables follow a normal distribution, which is due to the probability values of the post-tests for VMA, amounting to 0.052. This is greater

than the significance level of 0.05, and therefore, the researcher proceeds to verify the homogeneity of variance in the data through the Levene statistical test:

Table 07: Represents the results of the post-test field measurements for maximum aerobic speed to verify the homogeneity of the two samples in variance through the Levene statistical test (F)

Tests	Probability Value of Error	Calculated Levene (F) Value	Statistical Decision
VMA	0.167	2.038	The two groups are homogenous in variance

Significance level (0.05), degrees of freedom V1=1, V2=22, scheduled Levene (F)(4.3009)

Source: Prepared by the researcher

The results of the table clarify that the calculated Levene (F) value in the post-measurements for maximum aerobic speed reached 2.038, which is less than the scheduled Levene (F) value of 4.3009 at the significance level (0.05), degrees of freedom V1=1, V2=22. This indicates that the measurements are not significant between individuals of experimental group 1 and experimental group 2, demonstrating that the two groups are homogeneous in variance. The researcher can use parametric tests to identify statistically significant differences between the single group and the two groups in the physical field tests.

12. Presentation and Analysis of T-Test Results Between Pre-Test and Post-Test Physical Measurements Applied to the Research Group:

12.1 Presentation of T-Test Results for Maximum Aerobic Speed Between Pre-Test and Post-Test for Experimental Group 1:

To answer the first question:

Is there a statistically significant difference in the development of maximum aerobic speed through the training type "10"/10" straight line running between the pre-test and post-test for experimental group 1?

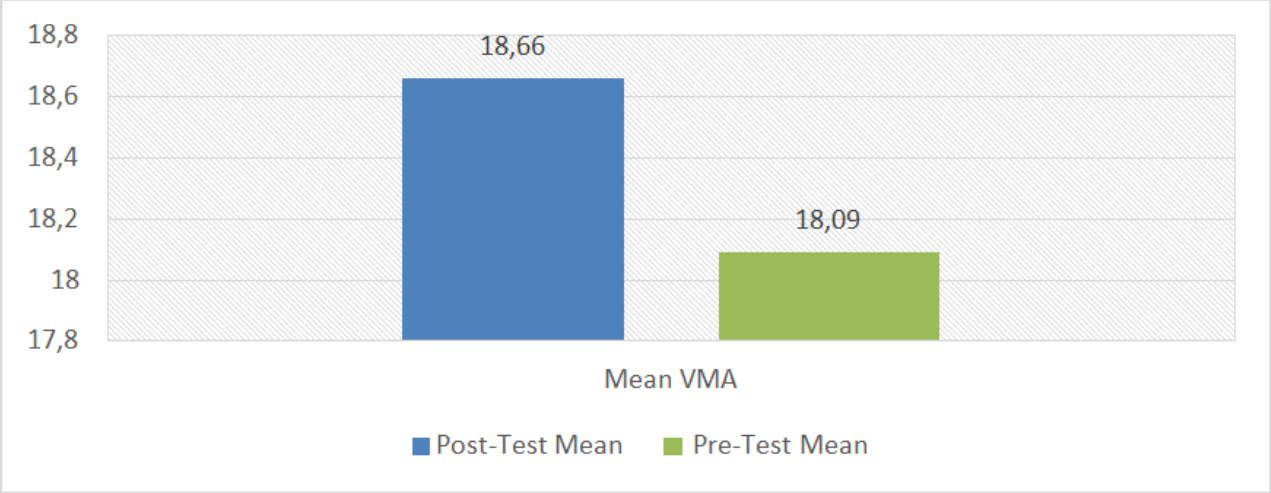
Table 08: Represents the T-Test results for maximum aerobic speed between the pre-test and post-test measurements for experimental group 1

Tests	Unit of Measurement	Experimental Group 1 (n=12)				T-Value (-/+)	Probability Value SIG
		Pre-Test Measurement		Post-Test Measurement			
		Mean	St.d	Mean	St.d		
VMA	(Km/h)	18.09	1.06	18.66	0.77	2.77	0.018

Significance level (0.05), degrees of freedom (11), scheduled T(2.201)

Source: Prepared by the researcher

Figure 01: Represents the differences in mean values for maximum aerobic speed between the pre-test and post-test for experimental sample 1.



Source: Prepared by the researcher

Results from table number (07) show statistically significant differences between the pre-test and post-test for maximum aerobic speed for experimental sample 1, where the probability value (sig) was 0.018, which is less than the significance level of 0.05. Also, considering the calculated T value of 2.77, which is greater than the tabulated T-test value of 2.201 at degrees of freedom (df=22), there are statistically significant differences favoring the post-test measurement, and the mean value for both measurements differ in statistical confidence level and is significant evidentially for the T-test for two related samples. From this, the researcher concludes that the intermittent training program with the "10"/10" straight line running" type had an effect on the level of maximum aerobic speed for experimental sample 1 (n=12), and these statistical differences are not due to chance but are attributed to the quality of the scientific method used in the training program.

12.2 Presentation of T-Test Results for Maximum Aerobic Speed Between Pre-Test and Post-Test for Experimental Group 2

To answer the second question:

Is there a statistically significant difference in the development of maximum aerobic speed through the training type "20"/20" shuttle running (back and forth) between the pre-test and post-test for experimental group 2?

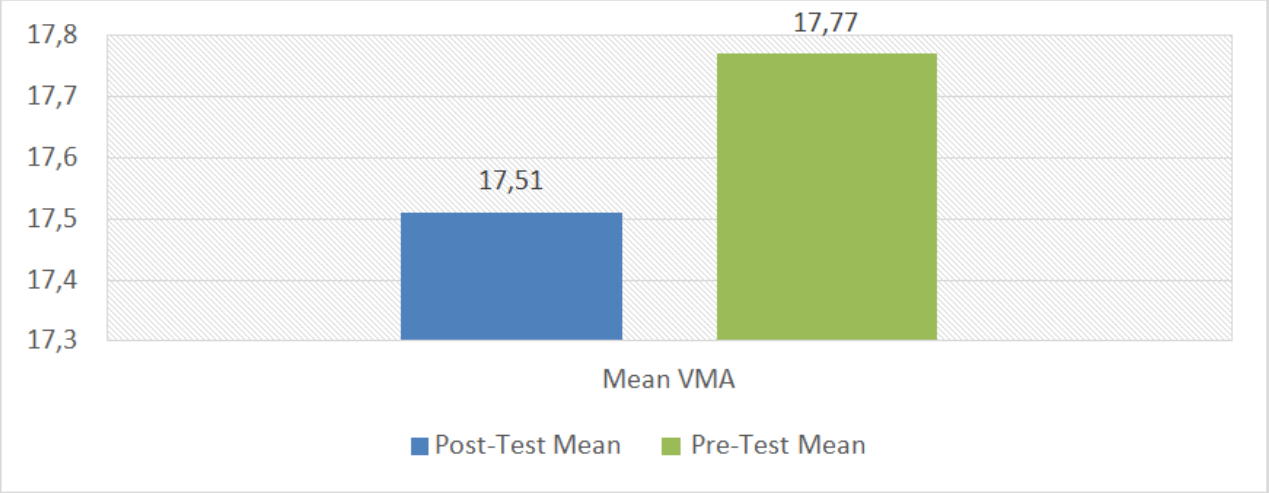
Table 09: Represents the T-Test results for maximum aerobic speed between the pre-test and post-test measurements for experimental group 2.

Tests	Unit of Measurement	Experimental Group 1 (n=12)				T-Value (-/+)	Probability Value SIG
		Pre-Test Measurement		Post-Test Measurement			
		Mean	St.d	Mean	St.d		
VMA	(Km/h)	17.77	1.53	17.51	1.39	0.933	0.371

Significance level (0.05), degrees of freedom (11), scheduled T(2.201)

Source: Prepared by the researcher

Figure 02: Represents the differences in mean values for maximum aerobic speed between the pre-test and post-test for experimental sample 2.



Source: Prepared by the researcher

Results from table number (08) show that the mean value for the post-test is higher than for the pre-test, indicating a difference in statistical confidence level. However, it is not significant evidentially for the T-test for two related samples due to the lack of statistically significant differences between the pre-test and post-test for maximum aerobic speed for experimental sample 2, where the probability value (sig) was 0.371, greater than the significance level of 0.05. Also, considering the calculated T value of 0.933, which is less than the tabulated T-test value of 2.201 at degrees of freedom (df=22), there are no statistically significant differences between the measurements. From this, the researcher concludes that the intermittent training program with the "20"/20" shuttle running (back and forth)" type did not produce statistically significant differences in the level of maximum aerobic speed for experimental sample 2 (n=12), as the "20"/20"" training type is categorized under "medium" intermittent training.

12. 3 Presentation of T-Test Results for Maximum Aerobic Speed Between Post-Test Measurements for Both Experimental Group 1 and Experimental Group 2

To answer the following question:

Are there statistically significant differences in the development of maximum aerobic speed between the post-tests for both experimental group 1 and experimental group 2?

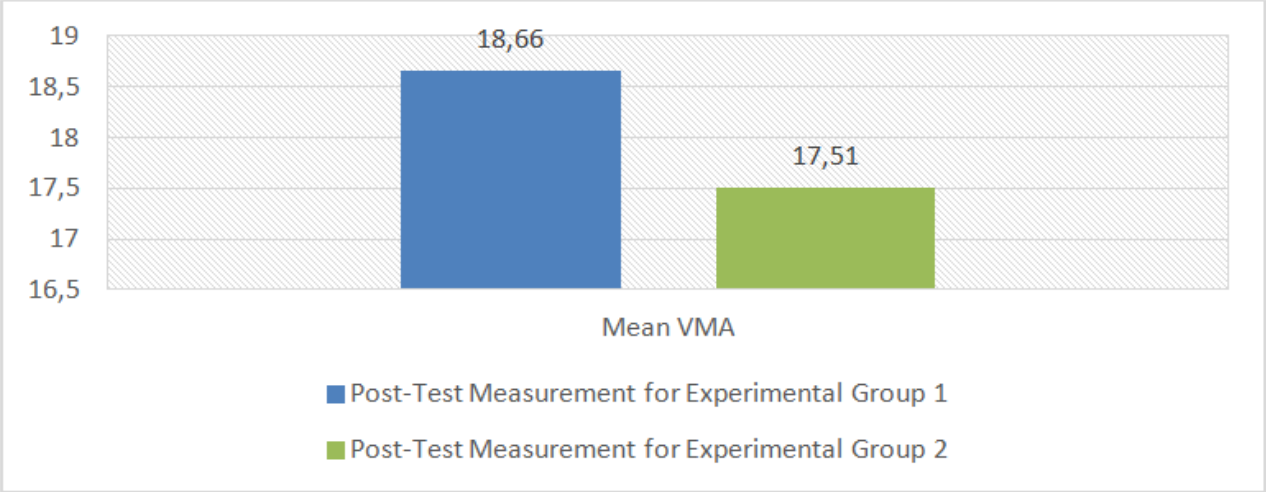
Table 10: Represents the T-Test results for maximum aerobic speed between the post-tests for both experimental group 1 and experimental group 2

Tests	Unit of Measurement	Experimental Group 1 (n=12)		Experimental Group 2 (n=12)		T-Value (-/+)	Probability Value SIG
		Post-Test Measurement		Post-Test Measurement			
		Mean	St.d	Mean	St.d		
VMA	(Km/h)	18.66	0.77	17.51	1.39	0.023	2.488

Significance level (0.05), degrees of freedom (11), scheduled T(2.201)

Source: Prepared by the researcher

Figure 03: Represents the differences in mean values for maximum aerobic speed between the post-tests for both experimental group 1 and experimental group 2.



Source: Prepared by the researcher

Results from table number (09) show statistically significant differences between the post-tests for maximum aerobic speed for both experimental group 1 and experimental group 2, where the probability value (sig) was 0.023, which is less than the significance level of 0.05. Also, considering the calculated T value of 2.48, which is greater than the tabulated T-test value of 2.201 at degrees of freedom (df=22), there are statistically significant differences favoring the post-test measurement for experimental group 1. The mean values for both measurements differ in statistical confidence level and are significant evidentially for the T-test for two independent samples. From this, the researcher concludes that the intermittent training program with the "10"/10" straight line running" type achieved a better development on the level of maximum aerobic speed for experimental sample 1 (n=12) compared to the other program with the "20"/20" shuttle running (back and forth)" type for experimental sample 2 (n=12). These statistical differences are not due to chance but are attributed to the quality of the scientific method used in the training program.

13. Discussion of the Study Results in Light of the Hypotheses and Previous Studies

13.1 Discussion of the First Hypothesis

There are statistically significant differences in the development of maximum aerobic speed through the training type "10"/10" straight line running between the pre-test and post-test for experimental group 1, favoring the post-test.

From table number (07), we observe statistically significant differences between the pre-test and post-test for maximum aerobic speed for experimental sample 1, favoring the post-test. This aligns with the researcher's hypothesis and is supported by (Cometti & Cometti, 2012), stating that intermittent sprint training develops maximum aerobic capacity provided that the intensity is close to maximum aerobic speed. This is consistent with studies by (Mansouri, 2015), (Sadouqi, 2021), and (Benruis, 2022), which found that short intermittent training develops maximum aerobic speed, as our study found with the "10"/10"" type. Running has been identified as the best and simplest means to develop maximum aerobic speed according to various old and new researches, which was the nature of our training program (straight-line running), and as previous studies have highlighted the importance of intermittent training in improving the efficiency of the cardiovascular respiratory system and developing maximum aerobic speed.

This was the case for experimental group 1 in developing maximum aerobic speed through the "10"/10" straight line running" training type between the pre-test and post-test. Through all the above, we say that the first hypothesis has been confirmed.

13.2 Discussion of the Second Hypothesis

There are statistically significant differences in the development of maximum aerobic speed through the training type "20"/20" shuttle running (back and forth) between the pre-test and post-test for experimental group 2.

From table number (08), we notice there are no statistically significant differences between the pre-test and post-test for maximum aerobic speed for experimental sample 2, which does not match the researcher's hypothesis. While running is the best and simplest means to develop maximum aerobic speed according to various old and new research, and previous studies have shown that intermittent training is crucial in enhancing the efficiency of the cardiovascular respiratory system and developing maximum aerobic speed, this was not the case through the "20"/20" shuttle running (back and forth)" type. The researcher attributes this to the nature of the shuttle running (back and forth), which affected the level of maximum aerobic speed development, where cardiac adaptation must be optimal due to training at the maximum oxygen consumption level according to (Jean-Christophe Hourcade, 2019).

Through all the above, we say that the second hypothesis has not been confirmed.

13.3 Discussion of the Third Hypothesis

From table number (08), we notice there are statistically significant differences in the development of maximum aerobic speed between the post-tests for both experimental group 1 and experimental group 2.

From table number (09), we say that there are statistically significant differences between the post-tests for both experimental group 1 and experimental group 2 in developing maximum aerobic speed. This aligns with the researcher's findings, supported by (Cometti & Cometti, 2012) and (Mansouri, 2015), stating that short intermittent sprint training develops maximum aerobic capacity provided the intensity is close to the maximum aerobic speed, which was evident in the "10"/10"" type compared to "20"/20"". Also, cardiac adaptation due to training was at the maximum level of oxygen consumption, which leads to the development of maximum aerobic speed, as "the maximum aerobic speed an individual can achieve at their maximum oxygen consumption" according to (Jean-Christophe Hourcade, 2019). Running is considered the best and simplest method for developing maximum aerobic speed according to (Georges Cazorla, 2005), and improvement in the aerobic system cannot occur unless the exercises are close to the maximum heart rate. The study by (Jean-Christophe Hourcade, 2019) found that working within 90 to 100% of the maximum heart rate ideally develops the maximum oxygen consumption or maximum aerobic speed, which was available in the nature of the "10"/10"" straight line running training compared to the "20"/20"" shuttle running.

Through all the above, we say that the third hypothesis has been confirmed.

13.4 Discussion of the General Hypothesis

Based on the previous discussion, it can be affirmed that: The acceptance of the general question, which investigates the effect of the two training programs using the intermittent training method through the training types 10"/10" and 20"/20" on developing maximum aerobic speed in U19 football players during the competition phase, is contingent upon the results obtained from the sub-hypotheses and linked to the statistical decisions reached.

Building on the discussion of the sub-hypotheses, which are the foundational blocks for the general hypothesis, and through the obtained results, statistical decisions made, and several research studies on this topic, the researcher acknowledges the acceptance of the first part (the first hypothesis) of the general hypothesis from a methodological and statistical perspective. This means that "intermittent training through the training type '10"/10" straight line running' had a positive effect compared to the training type '20"/20" shuttle running (back and forth)'," which is the second part (the second hypothesis) of the general hypothesis that was rejected because it was not effective in developing maximum aerobic speed. The acceptance of the third part (the third hypothesis) from a methodological and statistical perspective means that "there are statistically significant differences in the development of maximum aerobic speed between the post-tests for both experimental group 1 and experimental group 2 of the first professional football league U19 category during the first phase of the competition." Consequently, the general hypothesis of the research is accepted.

14. Conclusion

Many studies indicate that intermittent training significantly affects various aerobic and anaerobic capacities. Given the divergence in ideas, the researcher sought to shed light on the method of intermittent training. From all this and what has been discussed in our research, then presenting the results and analyzing them using statistical methods, and then discussing them and comparing the results with the hypotheses within the scientific methodology followed in this study and the sample on which the research was conducted, we have reached a set of conclusions, which we list as follows: The first training program showed a significant difference through the training type "10"/10" straight line running" which had a positive effect compared to the training type "20"/20" shuttle running (back and forth)" which had an effect but was not significant in developing maximum aerobic speed in U19 players of the first professional football league during the competition phase. Based on these conclusions, we have formulated a set of future suggestions that we hope will be constructive and assist coaches and physical trainers in football, especially in improving physical fitness in general and developing aerobic qualities and maximum aerobic speed in particular.

From the results derived from the study we conducted, we wanted to provide the following guidelines:

- The necessity of conducting physical tests at the beginning and end of each phase of the sports season to monitor the development of players' physical fitness levels and ensure their maintenance until the end of the sports season.

- More emphasis on intermittent training and its type 10"/10" in all sports to develop maximum aerobic speed.
- The training type 10"/10" is most suitable for developing maximum aerobic speed, especially in the competition phase, as this study was conducted during this phase.
- More focus on developing maximum aerobic speed because the duration of play and distance covered in football matches have increased.
- Relying on straight-line distances and running in a straight line to develop maximum aerobic speed.
- Ensuring appropriate and complete rest between training sessions when developing maximum aerobic speed.
- Development of maximum aerobic speed should occur in the second or third training session in a program consisting of 5 sessions per week plus competition day.
- It would be important to conduct other studies on the method of intermittent training to compare between its various training types and enlighten coaches and specialists about the effectiveness and degrees of development of these types for physical qualities.

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