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The Effect of a Meso-Cycle Training Program Using the (Short–Short) Intermittent Method on Developing Maximal Aerobic Speed (MAS/VMA) in U18 Basketball Players.

أثر دورة تدريبية متوسطة بطريقة التدريب المتقطع (قصير- قصير) في تطوير السرعة الهوائية القصوى VMA لدى لاعبي كرة السلة فئة U18.

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Abstract

The study aimed to identify the effect of a Meso-Cycle training program using the (Short–Short) intermittent method on developing maximal aerobic speed (MAS/VMA) in U18 basketball players. "Of Chabab Boukadir Club – Chlef. The study sample was purposive and consisted of (20) players. The researcher adopted the experimental method due to its suitability for the nature of the study. A structured intermittent (short–short) training program was applied to the experimental group for a period of six (06) weeks. Afterward, a post-test was conducted to assess maximal aerobic speed (MAS/VMA). The results revealed statistically significant differences at the 0.05 significance level in favor of the experimental group, indicating the effectiveness of the mesocycle training program using the (short–short) intermittent method.

الكلمات المفتاحية:

دورة تدريبية متوسطة
التدريب المتقطع (قصير- قصير)
السرعة الهوائية القصوى
كرة السلة
فئة U18

ملخص

هدفت الدراسة الى التعرفة على تأثير الدورة التدريبية المتوسطة بطريقة التدريب المتقطع (قصير- قصير) لتطوير السرعة الهوائية القصوى VMA لدى لاعبي كرة السلة فئة U18. لنادي فريق شباب بوقدير – الشلف – وكانت عينة الدراسة قصدية .تكونت من (20)، و لقد استخدم الباحث المنهج التجريبي نظرا لتلائمه مع طبيعة الدراسة، ثم طبق الباحث البرنامج التدريبي المقنن بطريقة المتقطع (قصير- قصير) على العينة التجريبية لمدة (06) أسابيع ، و بعدها قام الباحث بإجراء الاختبار البعدي على المجموعة التجريبية لصفة السرعة الهوائية القصوى MAS/VMA و قد تبين انه هناك فروق ذات دلالة إحصائية عند مستوى الدلالة 0.05 لصالح العينة التجريبية و هذا ما يدل على فاعلية الدورة التدريبية المتوسطة بطريقة المتقطع (قصير- قصير).

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1. Introduction

The improvement and development witnessed in global sporting performance in recent decades did not occur by chance; rather, it were the inevitable result of applying scientific research methods, proper programming, and sound planning, through the utilization of the principles and foundations of modern sciences in sports training, such as biomechanics, statistics, anatomy, medicine, psychology, and sociology. Sports training science is considered one of the prominent fields within sports science and represents the cornerstone upon which the process of athletic development is built. It aims to achieve progress and advancement in performance levels and sporting achievements, whether in individual or team sports. Consequently, the growing pursuit of sporting excellence has led scientists, experts, and specialized researchers in the sports field to study numerous training methods and means, and to experiment with different training programs and approaches in order to prepare athletes physically, psychologically, and technically. Moreover, training programs and methods have been developed to serve coaches and help them achieve optimal results across various sports disciplines. Physical preparation in basketball is regarded as one of the fundamental pillars required throughout the training season and its different phases. Physical preparation is defined as the applied process of enhancing the athlete's training status to develop physical and motor fitness. Since the training process aims to enable the athlete to reach the highest possible levels according to the training stage, it requires the coach to possess comprehensive knowledge and general as well as specific information related to the practiced sport. This is reflected in the sports planning of the training process, which necessitates full mastery of the theoretical and scientific foundations of training science **(El-Hawi, 2002, p. 18)**. Physical preparation is considered a crucial factor in the sports season, as the basketball player undergoes two phases: general preparation and specific preparation. General physical preparation is the process through which the efficiency of physical fitness components is developed in a comprehensive and balanced manner, while specific physical preparation aims to enhance the efficiency of the essential physical fitness components required for the specialized sport to the highest possible level (Mufti, 2001, p. 154). The short–short intermittent training method is considered one of the commonly used methods in team sports, including basketball, particularly during physical preparation. It is characterized by high intensity and aims to improve speed and develop strength and speed–strength. During this method, heart rate rises to approximately 180 beats per minute, while the training volume remains relatively low **(Ouda, 2016, p. 188)**

2. Research Problem

Physical preparation of basketball players has become a major concern for technical staffs in the processes of preparation and planning for the training season, through scientifically based and well-structured training programs aimed at bringing players to the highest possible level of sport-specific physical fitness. The most important components and attributes of physical fitness include endurance, strength, speed, flexibility, and agility. Consequently, developing these physical attributes has become one of the fundamental pillars of daily, weekly, periodic, and annual training plans. Scientific advancement in training methods is considered a major objective pursued by countries worldwide in order to present knowledge and concepts in a simplified manner to coaches, with the aim of preparing and developing athletes to reach high performance levels. Indeed, there has been a noticeable improvement in the performance level of basketball teams at the elite level in general, which necessitates the adoption of scientific approaches in training to keep pace with this development. Physical preparation is considered one of the most important requirements of basketball, as it contributes to the development of other physical attributes such as strength, speed, endurance, and agility, in addition to motor coordination ability. The development of these attributes usually occurs during the general and specific preparatory periods for players, and is conducted according to objective measurements that correspond to the players'

capabilities. Physical preparation is the main gateway to achievement through regular training, which in turn leads to mastery of technical and tactical performance with a high level of efficiency and effectiveness. Physical preparation is regarded as an essential phase during the sports season, during which the player undergoes general physical preparation followed by specific physical preparation according to the specialization required. Maximal aerobic speed (MAS/VMA) is considered one of the components of specific endurance, representing the player's ability to perform motor tasks related to the specialized activity efficiently and effectively for the longest possible duration (Yahya El-Sayed, 2002, p. 153).

Barnard Turpin indicates that team sports, including basketball, are anaerobic–aerobic in nature, with a primary determining factor being maximal aerobic speed (MAS/VMA) (Turpin, 2002, p. 10). Naturally, assessing maximal aerobic speed allows for the determination of the training level in physical preparation.

This is supported by the research of Gacon, which provided proponents of the specific approach with physiological evidence based on the principle that fast-twitch muscle fibers can easily transform into slow-twitch fibers, whereas the reverse is difficult to achieve (Turpin, 2002, p. 136).

the following main research question is posed:

Does the use of a mesocycle training program based on the (short–short) intermittent method develop maximal aerobic speed (MAS/VMA) in U18 basketball players?

From this main question, the following sub-questions arise:

Are there statistically significant differences at the 0.05 significance level between the pre-test and post-test results of the experimental group in the development of maximal aerobic speed (MAS/VMA) in U18 basketball players, in favor of the post-test?

Are there statistically significant differences between the pre-test and post-test results for maximal aerobic speed (MAS/VMA) in the control group?

Are there statistically significant differences in the post-test results between the experimental and control groups in favor of the experimental group?

1-2- Research Hypotheses

Main Hypothesis

The use of a mesocycle training program based on the (short–short) intermittent method develop maximal aerobic speed (MAS/VMA) in U18 basketball players.

Partial Hypotheses:

1-There are statistically significant differences between the pre-test and post-test results of the experimental sample at the 0.05 significance level in the development of maximal aerobic speed (MAS/VMA) in U18 basketball players, in favor of the post-tests.

2-There are statistically significant differences between the pre-test and post-test for maximal aerobic speed (MAS/VMA) in the control group.

3- There are statistically significant differences in the post-test between the experimental and control groups in favor of the experimental group.

1-3-. Research Objectives:

In view of the importance that characterizes basketball players in terms of morphological, physical, and psycho-motor characteristics, and based on a future-oriented perspective aimed at achieving an acceptable level of preparation and competition for this category, the objectives of this research are as follows:

- To highlight the importance and role of maximal aerobic speed (MAS/VMA), alongside other physical qualities, and its effect on improving performance in the U18 age category.

-To determine whether there are statistically significant differences between the pre-test and post-test for maximal aerobic speed (MAS/VMA) in favor of the post-test for the experimental sample.

- To identify the effect of a training program using the intermittent training method (short–short) on the development of maximal aerobic speed (MAS/VMA) in U18 basketball players.

1-4- Importance of the Research This research addresses several theoretical and applied aspects, including:

Determining the extent of the relationship between maximal aerobic speed (MAS/VMA) and the under-18 age category practicing competitive basketball.

Conducting a rich theoretical bibliographic study based on references by scholars and professors in the fields of physical education, sports sciences, and sports training. Contributing to the development of maximal aerobic speed (MAS/VMA) in U18 basketball players.

1-5- Main Terms:

1-5-1- Medium Training Cycle (Meso- Cycle):

It is a periodic load cycle consisting of a set of micro training cycles that include a relatively integrated training phase within the planning of the sports season. The most appropriate duration for a medium training cycle ranges from 04 to 06 weeks **(Al-Bassaty, 1998, p. 149)**. 5.1.2. Short–Short Intermittent Training:

Terminologically: It is one of the training theories in which the trainee divides the work time into segments, with a rest period equal to the work period for each repetition. It is an alternation between work and rest. According to Turpin, it is work that includes alternation between relatively short work periods (5 to 30 seconds, at speeds equal to or greater than MAS/VMA) and rest periods ranging from 15 to 30 seconds **(Turpin, 2002).**

Operationally:

It is a training method that combines work periods followed by rest periods. It includes short, medium, and long types. Short–short intermittent training does not exceed 15 seconds of work, with rest periods ranging from 20 to 30 seconds, and an intensity ranging from 120% to 130% of maximal aerobic speed.

1-5-3- Maximal Aerobic Speed (MAS/VMA):

Terminologically: It is the maximal speed that can be achieved during running. During this type of running, the body reaches its maximum oxygen consumption, known as VO_2max. It is the maximal running speed corresponding to VO_2max **(Reiss&Prévost, 2013, p. 123).**

6. Previous and Related Studies

Previous and related studies are considered an important reference that the researcher should address and use to enrich the research. The purpose of these studies is comparison and verification or refutation. In light of the topic of our research, we referred to a set of previous studies.

6-1- Study by Belaroussi and al. (2022) "The Effect of a Proposed Training Program Based on the Alternating Training Method (Short–Short) Integrated with Visual Mental Imagery Technique on the Development of Explosive Strength in U19 Football Players." This study aimed to examine the effect of proposed training units on developing the level of explosive strength in under-19 football players. The experimental method was used, and the sample was selected intentionally, consisting of (20) under-19 players from the amateur club of the municipality of Ain Merane. After implementing the experiment and statistically processing the results, the study concluded that the use of visual mental imagery as a technique integrated with the alternating training method (short–short) had an effective impact on developing explosive strength in favor of the experimental group, compared to the control group, which followed the regular training program using only the alternating training method (short–short) without integration **(Belaroussi&al., 2022, p. 1262–1273).**

6.2. Study by Derraji Abbas et al. (2019):

The Effect of Alternating Training and Small-Sided Games Training on Maximal Aerobic Speed in Senior Football Players. This study aimed to determine the effect of both alternating training and small-sided games training on maximal aerobic speed in senior football players. To achieve this objective, the researchers used the experimental method on a sample consisting of 24 players from the Youth Sports Club of Bordj Okhriss, who were divided into two groups, each subjected to a different training program: one group followed the alternating training method, while the other followed training based on small-sided games.

The results of the study showed that both alternating training and small-sided games training contribute to the development and improvement of maximal aerobic speed in football players, with a relative advantage in favor of alternating training compared to small-sided games training. In light of these findings, the researchers recommended paying greater attention to the physical aspect in football training by relying on modern scientific methods, particularly those related to the physiological component. They also advised coaches to use both alternating training and small-sided games training to develop maximal aerobic speed in their players throughout the entire sports season, due to their ability to integrate the ball, which also allows for the development of technical and tactical aspects, as required by modern football **(Derraji&al., 2019, p. 405–425).**

1-6-3 Study by Abdallah Mansouri (2017)

The Effect of Short–Short Intermittent Training on Maximal Aerobic Speed in U20 Football Players. This study aimed to identify the extent to which a training program based on the short–short intermittent training method contributes to the development of maximal aerobic speed in under-20 football players. To examine the effectiveness of the proposed program, the researcher conducted a study at the level of the provincial championship in Guelma, which included (240) players during the 2014–2015 sports season. The study sample consisted of two teams selected intentionally from the research population: Ain Raggada team with (18) players as the experimental group, and Bordj Sabbat team with (18) players as the control group. The researcher adopted the experimental method by conducting a pre-test on December 15, 2014, followed by the implementation of the sports training program designed by the researcher, and concluding with a post-test on February 15, 2015. Through the analysis of the results, the researcher concluded that the training program based on the short–short intermittent training method had a positive and significant effect on the development of maximal aerobic speed in under-20 football players **(Mansouri, 2017, p. 271–283).**

2-Research Methodology

2.1. Research Method :

Given the nature of the research topic, the experimental method was adopted. The study relied on an experimental design involving two groups. This type of research uses experimentation to test a hypothesis that establishes a relationship between two factors or variables, through the study of contrasting situations in which all variables are controlled except the variable whose effect the researcher seeks to examine **(Al-Tamimi, 2013, p. 24).**

Experimental Design:

The researcher adopted the equivalent groups design. This design involves more than one group, specifically two groups: an experimental group and a control group. The experimental group is exposed to the causal (independent) variable, while the control group is kept away from its influence. At the end of the experiment, the results of both groups are measured with respect to the phenomenon referred to as the dependent variable **(Abdel Majid, 2000, p. 143).**

2-2- Study Variables

This research included the following variables:

Independent variable: Intermittent training (short–short).

Dependent variable: Maximal aerobic speed (MAS/VMA).

2-3- Study Fields:

2-3-1- Human Field:

The study sample was selected intentionally and consisted of (20) players from the Chabab Boukadir Basketball Club. The sample was divided into a control group and an experimental group, with (10) players in each group.

2-3-2- Spatial Field:

The study was conducted in terms of implementing the training program and administering the pre- and post-tests at the Multi-Sports Hall of July 5, 1962, in Boukadir.

2-3-3- Temporal Field: The study was carried out during the period from 12/11/2024 to 26/12/2024. During this period, the training program was applied

to the experimental sample, and pre- and post-tests were conducted for the study sample.

2-4- Research Population and Sample

Population consists of U18 basketball players participating in the Inter-League Championship (Central–West Group), comprising (16) teams representing the study population.

The population is defined as a group of clearly identified statistical units from which data are obtained. The research sample is a part of the population on which the study is conducted; it is selected by the researcher according to specific rules to ensure accurate representation of the population **(Rahim and Al-Azzawi, 2008, p. 161)**. According to that the study sample consisted of (20) U18 basketball players.

2-5- Research Tools Tests:

Test for Measuring Maximal Aerobic Speed (VAMEVAL Test):

Purpose of the Test:

- To measure maximal aerobic speed (MAS/VMA) and maximal oxygen consumption (VO_2max). Performance Specifications: The athlete runs on a 200 m or 400 m track at a progressively increasing speed.

- The track is divided into equal distances of 20 meters.

- Speed is increased by (0.5 km/h) at each stage (palier).

- The duration of each stage (palier) is 1 minute.

- The test starts at a speed of 8 km/h.

- Players take starting positions from different markers (cones placed on the track).

- Players run according to the rhythm of an audio signal (beep); upon hearing the beep, the player must be at the designated cone.

- The test ends when the player is unable to maintain the running rhythm, meaning failure to reach the cone at the beep (late arrival).

- If late arrival occurs twice, the test is stopped (when the player is more than 2 meters away from the cone).

- The time achieved by the player and the number of completed stages (paliers) are recorded. Maximal aerobic speed is determined using the test's reference table **(Bolliet, 2012)**.

- The Pilot Study:

conducted a pilot study on a sample of (5) players from outside the main study sample to verify the validity of the physical test and its suitability for the research sample, to identify errors and obstacles that might accompany the experiment, to calculate the time required to conduct the tests, and to determine the scientific bases of the tests.

- Reliability Test: The test–retest method was used, which is widely applied in the field of general testing and measurement to determine the reliability coefficient. This method involves the following steps: defining the test, selecting the sample on which the test is administered, conducting the test for the first time and calculating the results, conducting the test a second time under the same conditions and on the same group, and then calculating the correlation coefficient between the results of both test administrations **(Ibrahim, 2000, p. 87).**

- Validity Test :

A valid test is one that measures what it is designed to measure **(Boudawoud, 2010, p. 69)**.

The researcher used content validity to verify the validity of the tests by presenting them to a group of experts and specialists in the field of sports training, who confirmed the suitability of the test. To obtain test validity, the self-validity coefficient was used.

Table 1

Table title Shows the values of the reliability coefficient for the maximal aerobic speed (VMA) test.

Tests	Simple	Degrees of Freedom	reliability Test	validity Test
VAMEVAL Test	05	04	0.93	0.96

Source: Feghouli samir

The significance level was set at α = 0.05. Based on

Table No. (01), it is evident that all tests demonstrated a high level of reliability. The reliability coefficient for the VAMEVAL test reached 0.93, indicating a strong correlation between the test results and the retest results.

-- Statistical Treatment The following statistical methods were used:

Arithmetic mean (X̄) Standard deviation (SD) Student's t-test Pearson correlation coefficient.

4- Presentation and Discussion of Results Statistical:

Parameters and t Values for the Research Variables:

Table 2

Table title: This table shows the homogeneity between the experimental group and the control group in the variables of body weight, height, chronological age, and training age.- Skewness Coefficient The skewness coefficient was calculated using the following formula: Skewness = 3 (Mean − Median) / Standard Deviation **(Al-Manizel&Ayesh, 2010, p. 44).**

Variable	X	S	Median	formula: Skewness	Signifi-cance of Diffe-rences
Height ((cm	176.96	3.77	177.65	-0.254	Moderate
(Weight (kg	74.67	7.82	.75 07	-0.358	Moderate
(Age (year	17.21	0.084	17.15	+0.1035	Moderate
Years of Training	7.18	1.02	7.06	-0.584	Moderate

Source: Feghouli samir

Based on Table No. (02), the skewness coefficients for the study variables of height, weight, age, and training age were as follows: (−0.254), (−0.358), (+1.035), and (−0.584), respectively. All values fall within the range of (±3), which indicates the homogeneity of the research sample.

Table 3

Table title This table presents the arithmetic means, standard deviations, and the calculated and tabulated t values for the pre- and post-tests of both the experimental and control groups in the maximal aerobic speed (VMA) test.

Control Group	Experimental Group	Sample size			Significance of Differences	Critical t-value (tcrit)	Calculated t-value(tcalc)	Not Statistically significant	Statistically significant
			Pre-test	Post-test					
			S	A					
10	10					2.262	0.256		
			16.41	2.13					
			16.75	2.23					

Source: Feghouli samir

Table No. (3) presents the results of the pre-test and post-test for both research groups in the maximal aerobic speed (MAS/VMA) test. The results revealed the existence of differences between the pre-test and post-test. The arithmetic mean of the post-test was 17.69 for the experimental group and 16.75 for the control group. The standard deviation was 0.27 for the experimental group and 2.23 for the control group. The calculated t value (8.380) was greater than the tabulated t value (2.262). This indicates the presence of statistically significant differences in favor of the experimental group in the post-test. In contrast, no statistically significant differences were found for the control group, as the calculated t value (0.256) was less than the tabulated t value (2.262).

5. Conclusion

Based on the completed study, and drawing from both theoretical and applied investigations, the effect of a medium training cycle (meso cycle) using the short–short intermittent training method on the development of maximal aerobic speed (MAS/VMA) in U18 basketball players was examined. Through data collection and statistical analysis, the following conclusions were reached:

There are statistically significant differences between the pre-test and post-test of the experimental group in the maximal aerobic speed (MAS/VMA) test, in favor of the post-test. The calculated t value for the experimental group in the VMA test was

8.380, while it was 0.252 for the control group. The tabulated t value was 2.262 at a significance level of 0.05, indicating statistically significant differences for the experimental group. This improvement is attributed to the effectiveness of the medium training cycle (meso cycle) based on the short–short intermittent training method in developing maximal aerobic speed (MAS/VMA) among U18 basketball players. The results of the present study are consistent with those of Abdallah Mansouri (2017), entitled "The Effect of Short–Short Intermittent Training on Maximal Aerobic Speed in Under-20 Football Players," which emphasized the importance of the short–short intermittent training method in developing maximal aerobic speed (MAS/VMA). The findings are also supported by the study of Derraji Abbas et al. (2019), entitled "The Effect of Alternating Training and Small-Sided Games Training on Maximal Aerobic Speed in Senior Football Players." On the other hand, no improvement or statistically significant differences were observed in the post-test of the control group. Based on the presentation, analysis, and discussion of the results in relation to the research hypotheses, it can be concluded that the hypotheses were confirmed and that the proposed training program, built on sound scientific principles and appropriate for the targeted age category and physical attribute, was effective.

- Suggestions and Recommendations:

- Relying on training programs based on the short–short intermittent training method within coaches' training units during special physical preparation for basketball players and other sports, due to their importance in developing specific physical qualities.

- Conducting further studies similar to the present research to examine their effects on improving the physical and skill levels of basketball players.

- Emphasizing the use of the short–short intermittent training method in training to develop specific endurance in general and endurance in particular.

- Extending such studies to other sports disciplines, as this study was conducted during the phase of special physical preparation, which differs from one sport to another.

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