Journal of Sport Science Technology and Physical Activities
ISSN : 1112-4032
eISSN 2543-3776

VOL 21 / N°: 01 (20 June 2024), p:86/99

The effect of training loads using hypoxic training method in developing some physiological variables for middle-distance juniors runners of 800 meters

Soufiane MAHI[1] ; Maamar Badreddine BENSAADA[2] ; Abdelkader MOKHTARI[3]
[1, 2, 3] Innovation et Performance Motrice Lab, Hassiba Benbouali University of Chlef, Algeria.
[1]s.mahi@univ-chlef.dz , [2]bensaadaieps@yahoo.fr , [3]a.mokhtari.ieps@gmail.com

ARTICLE INFORMATION
Original Research Paper
Received : 15/07/2023
Accepted : 29/09/2023
Published :01/06/2024

Keywords :
Hypoxic training
Training load
Physiological variables
Middle-distance runners

Corresponding author:
Soufiane MAHI,
e-mail: s.mahi@univ-chlef.dz

Abstract

This study aims to show the effect of the hypoxic training method in developing some of the necessary physiological variables (Maximum anaerobic capacity (AC), Maximum rate of O2 consumption (VO2 max), Maximum Aerobic Speed (MAS)) that the runner needs to improve achievement in middle-distance running, specializing in 800 meters among juniors.

The study was conducted on a sample of 20 runners in divided to an experimental and control group. The program was applied via suggested exercises in a hypoxic method on the experimental sample and leaving the control sample to be trained in the ordinary program.

The researchers concluded that the use of suggested training program based on hypoxic training method has a positive effect on improving some functional variables, and it also affected a greater percentage than the ordinary program to improve results in the middle-distance running, specializing in 800 meters, so it is recommended to use the hypoxic training method to develop the physiological qualities of athletics.

1. Introduction

In recent times, athletics has witnessed a remarkable development in breaking records until it reached the level of human miracles, thanks to the clear scientific progress in various sports sciences such as training science, biological, biomechanics, biochemistry and sports medicine, and what these sciences give in developing systems Training and improving performance methods.

Lamp (1984) indicates that the progress of sports levels depends on several factors, including improving the functional level of the athletic body's organs. (Lamp, 1984)

Muhammad Othman (1990 AD) also indicates that the process of physical and functional preparation, general and specific, for middle-distance athletes depends on giving them a certain amount of both aerobic and anaerobic energies in different proportions. It is also known that anaerobic energy depends on its construction and development on a good level of aerobic energy, That is, the process of starting anaerobic energy training must depend on a good level of aerobic energy. (Allawi, 1994)

Abul-Ela Abdel-Fattah (1997 AD), Muhammad Othman (2000 AD), Baha Salameh (2002 AD) and Ali Jalal (2004 AD) indicate that the process of rationing the training load constitutes the structure of training programs in terms of intensity The size and comfort used by the coach to reach his players to the phenomenon of physiological adaptation and thus raise the level of athletic performance.

Hypoxic training is one of the important exercises in the process of regulating breathing, and it is one of the most important conditions for the progress of achievement, as well as the role it plays in the variables.

Hence the importance of the research in setting the legalization of a training program using hypoxic training in the development of some physiological variables for middle-distance runners specializing in 800 meters among juniors.

2. Literature Review

A study by Mr Bassiouni (2002) study entitled (The effect of developing aerobic and anaerobic abilities on some biochemical and physiological

variables and the digital level of middle distance runners). He concluded that the development of aerobic and anaerobic abilities led to an improvement in the physiological and biochemical variables and the digital level of middle distance runners.

The Study of Hamdi Muhammad Ali (2004 AD) study entitled (The effect of developing anaerobic endurance on some physical and physiological variables and the digital level for 1500m runners), and the Study of Hakkinen and Myllyla (1990 AD) A study entitled (A study on the severe effects on muscle fatigue and recovery on the production of strength and relaxation in strength, endurance and ability athletes). The most important results were the specialization and preference of long-acting training stimuli, thus distinguishing the components or special elements of the energy production processes and the neuromuscular processes that occur This study aims to identify the effect of a regulated training program using hypoxic training on some physiological variables for young middle-distance runners.

- Research hypotheses:

- Hypoxic training is positively affects the improvement of some functions and physiological variables for young middle-distance runners.
- The codified training program achieves a significant increase in the measurements of functional traits in the dimensional measurement, and consequently the individual achievement of the junior middle-distance runners for the benefit of the experimental group.

2. Method and Materials

To solve the problem of the current research, the researcher used the experimental method, which is "the only research method that can truly test the hypotheses of cause or effect ". (Allawi & Ratib , Scientific Research in the Sports Field , 1987)

2.1. Participants

As for the sample of the research on which the experiment was carried out and due to the nature of the research and the methodology used, the research sample is chosen deliberately from two athletics teams in the state of Chlef, which numbered 20 runners for the cub's category from 16-17

years, divided into two groups, the Chlef Youth Union team as a control sample (10 runners), running speciality 800 meters, and the second group was represented by the Chlef Youth Sports Team (10 runners) specializing in running 800 meters as a test sample. Both teams are active in the state athletics championship and are registered in the National League (Western side) and they are 13 teams for the 2021/2022 sports season.

The homogeneity of the sample members was taken into account in the variables of the characteristics of the research sample (age - height and weight, any of the same specifications as it appears from their appearance) and the training age (more than 3 years of training).

2.2. Materials

- Arab and foreign sources and references.
- Physiological tests: The researcher relied on a battery of standardized tests after it was nominated by some professors and coaches that measure the physical aspect of runners who ran 800 runners from 16 to 17 years old, in addition the tests.

- The proposed training program: The planning of the program consisted of a large training circle divided into two medium training circles and the latter divided into 10 small circles consisting of 4 lessons for each circle, interspersed with a small training circle for positive rest. age stage.

That is, rationing training loads using the physiological indicator, heart rate, time, and applying the principles of training and training methods, with the introduction of the preparation of suggested exercises using the hypoxic method, and it is objective:

Preparing and qualifying middle-distance players, and means the need to develop and develop general endurance (respiratory periodic endurance), which leads to an increase in the efficiency of the body's physiological systems, especially the respiratory system, as an essential characteristic of this speciality.

As for the control sample, the normal program was applied to it by the fellow trainer who supervised their training, relying on his training according to the researcher’s observations on the method of competition (competitions).

2.3. Exploratory study

Test Stability: To measure the validity of the tests, the researcher calculated the stability coefficient for each test, both physical and physiological tests, and after performing the tests (before and after) for the exploratory experiment according to its specification, the researcher performed statistical treatment and extracted the results using the simple correlation coefficient known as Pearson's correlation.

Validity of the test:

To ascertain the validity of the tests, the researcher used subjective honesty as the most honest experimental score concerning the real degrees that got rid of their impurities of measurement errors, which is measured by calculating the square root of the test stability coefficient.

Honesty √ (Stability Coefficient)

Relying on this type of honesty, we reached the results shown in the table at the significance level of 0.05 and the degree of freedom (n-1).

Table 1. shows the validity and Stability coefficients of the tests.

Physical and physiological tests	Sample size	Pearson value (stability coefficient)	Honesty coefficient	Pearson Table Value coefficient (r)	Degree of freedom (n-1)	Significance Level
1. Maximum anaerobic capacity AC (run 30m)		0.77	0.87			
2. Brikci test (Run 5mn) (Maximum rate of O_2 consumption (VO_2 max)		0.74	0.86			
3. Maximum Aerobic Speed (MAS) (Brikci test)	10	0.86	0.92	0.602	09	0.05

2.4.Design and Procedure

- Human domain: The sample of the testers, who were targeted by the research, consisted of 800-meter freestyle runners from 16 to 17 years of age, whose number was 20 players divided into two teams, each team containing 10 runners. Physical preparation, and the control sample that was left practicing normal physical preparation.

- Spatial Domain: The research was carried out in the Mohamed Boumzrag sports complex in Chlef because it contains an official track for athletics.

Program application period:

Steps of applying the training program via training loads:

Suggested training program:

The planning of the program consisted of a large training circle divided into two medium training circles (Mesocycle) and the latter divided into 10 small circles (Microcycle) consisting of 4 lessons for each circle, interspersed with a small training circle for positive comfort. Rest and hypoxic exercises during the training period.

Planning the training program via training load:

Organizing the training work with the experimental research sample during the basic experiment:

The researcher supervised the training of the experimental sample according to a proposed training program that uses the circular and continuous method to develop the capacity for endurance among juniors in the speciality of middle distances.

The planning of the program consisted of a large training circle divided into two medium training circles and the latter divided into seven small circles consisting of 8 lessons for each circle, interspersed with a small positive training circle. Hypoxic exercises and taking into account the age stage.

• Do not use more than 25-50% of the total volume of the training dose when using hypoxic training.

• Hypoxia exercises are used with speed limitation so that very few fast repetitions are performed using this method.

Program application period:

Table 2. ***Shows the structure of the training program and period..***

2021/11/15				**2021/10/15**		
Microcycle N° 7 Maximum Load	**2021/11/07**			**Microcycle N° 3 Load above Average**	**2021/10/07**	
	Microcycle N° 6 Load less than maximum	**2021/10/30**			**Microcycle N° 2 Load above Average**	**2021/09/29**
		Microcycle N° 5 Load less than maximum	**2021/10/22**			**Microcycle N° 1 Average load**
			Microcycle N° 4 Load above Average			
2021/11/22	**2021/11/14**	**2021/11/06**	**2021/10/29**	**2021/10/21**	**2021/10/14**	**2021/10/06**

Figure 1. Distribution of Intensity and Volume during Mesocycle Training Circuit No. 01 for General Physical Preparation.

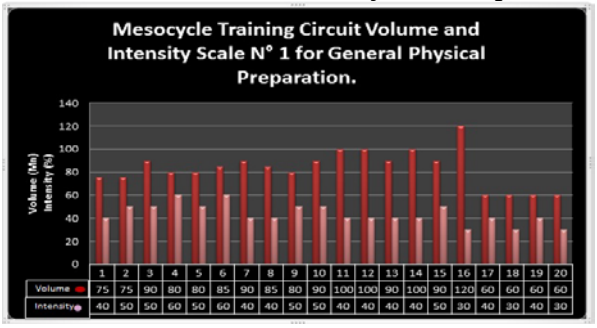


Figure 2. Distribution of Intensity and Volume during Mesocycle Training Circuit No. 02 for Specific Physical Preparation.

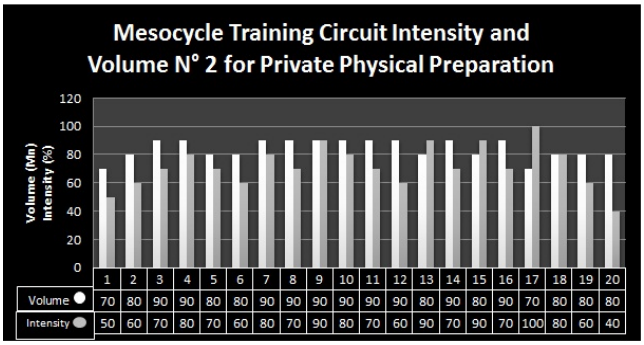
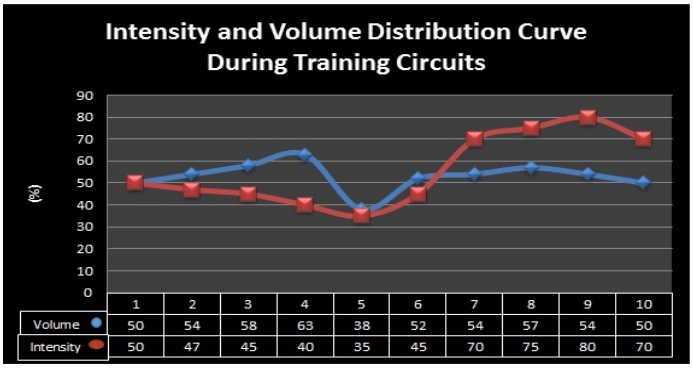


Figure 3. Relationship Curve between Intensity and Volume during Mesocycle Training Circuit No. 01 for Physical Preparation.



2.5. Statistical Analysis

We used IBM-SPSS V24 to treat the collection data statistically through these laws : The mean ($\bar{x}$) and the standard deviation (S), Pearson correlation coefficient, T-Test to find the statistically significant differences among the means of our two groups.Results

3.1. Presentation and analysis of the results of the pre-physical tests for the two research samples:

Table 3. shows the results of the anthropometric measurements and the training age of the two research samples.

Variables	Experimental group		The control group		Critical T Value	Calculated T Value	Statistical Significance
	$\bar{x}$	S	$\bar{x}$	S			
Age	16.40	0.92	16.50	0.95	2.10 At the degree of freedom 0.05	0.70	not significant
Length	1.65	0.04	1.66	0.13		0.28	not significant
Weight	59.70	1.97	58.40	2.10		0.50	not significant
Training age	3.5	0.71	3.6	0.91		0.55	not significant

We have reached through the statistical treatment of the pre-raw results of the two research samples with the Student test as shown in Table No. (03) all the calculated (T) values were confined between (0.28) as the smallest value and (0.70) as the largest value, which is smaller than the tabular t, which amounted to (2.10) at the degree of freedom "18" and the significance level is 0.05 in the anthropometric tests, which confirms the absence of significant differences between these averages, i.e. It has no statistical significance, which confirms the extent of homogeneity between the two samples in the measurements of height, weight and age.

.***Table 4. shows the value of (t) "student" calculated in the pre-tests of the two research samples.***

Statistical study / Tests	Sample number	Degree of freedom (2n-2)	Level of statistical significance	Critical T Value	Calculated T Value	Statistical significance
1. Maximum anaerobic capacity AC (run 30m)	20	18	0.05	2.10	0.80	not significant
2. Brikci test (Run 5mn) (Maximum rate of O_2 consumption (VO_2 max)					0.80	not significant
3. Maximum Aerobic Speed (MAS) (Brikci test)					0.21	not significant

It is also clear to us in Table No. (04) that there are no significant differences, which indicates the homogeneity and parity of the two sample groups in all physical tests, and this indicates that there are no significant differences between these averages, meaning that the differences between the means have no statistical significance and therefore this achievement The statistician confirms the homogeneity of the research sample in these tests.

3.2. Presentation and analysis of the results of the pre and post-physiological tests of the control sample:

Table 5. shows the value of (t) "student" calculated in the pre-tests of the two research samples.

Statistical study / Tests	Sample number	Degree of freedom (n-1)	Level of statistical significance	Critical T Value	Calculated T Value	Statistical significance
1. Maximum anaerobic capacity AC (run 30m)	10	9	0.05	2.26	5.40	significant
2. Brikci test (Run 5mn) (Maximum rate of O_2 consumption (VO_2 max)					4.20	significant
3. Maximum Aerobic Speed (MAS) (Brikci test)					3.11	significant

3.3. Presentation and analysis of the results of the pre and post-physiological tests of the experimental sample:

Table 6. shows the significance of the difference between the averages of the results of the pre and post-tests for the experimental research sample.

Statistical study / Tests	Sample number	Degree of freedom (n-1)	Level of statistical significance	Critical T Value	Calculated T Value	Statistical significance
1. Maximum anaerobic capacity AC (run 30m)	10	9	0.05	2.26	5.51	significant
2. Brikci test (Run 5mn) (Maximum rate of O_2 consumption (VO_2 max)					3.19	significant
3. Maximum Aerobic Speed (MAS) (Brikci test)					5.63	significant

- Comparing the results of the physiological tests for the two research samples in the post-test:

The researcher processed the obtained results statistically, using "t" "student" and this calculated the calculated "t" values and compared them to the tabular value of "t" (2.10) and this is at the level of significance 0, 05 and the degree of freedom is 18 as shown in the table.

Table 7. ***shows the comparison of the results of the post-test for the two research samples using the significance of differences (T) test.***

Statistical study / Tests	Sample number	Degree of freedom (2n-2)	Level of statistical significance	Critical T Value	Calculated T Value	Statistical significance
1. Maximum anaerobic capacity AC (run 30m)	20	18	0.05	2.10	2.39	significant
2. Brikci test (Run 5mn) (Maximum rate of O_2 consumption (VO_2 max)					4.07	significant
3. Maximum Aerobic Speed (MAS) (Brikci test)					2.42	significant

Through Table No 07, which shows the "t" values calculated in the post-tests, it was found that: The "t" value calculated in all physical tests was greater than the tabular "t" value estimated at (2.10) at the significance level 0.05 and the degree of freedom 18. This means that there are significant differences between the two groups, and therefore there is no homogeneity in the research sample in the post-test, and that this statistical significance between the results of the two groups in the physical tests that were under study and which should be available for middle-distance runners in general and specialization 800 meters in particular and is in favour of the experimental group.

4. Discussion

The results of the post-test of the two research samples in the physiological tests show that all the differences that occur between the average results of the tests have statistical significance in favour of the experimental sample to which the training sentence rationing program is applied using hypoxic training.

During the presentation and discussion of the results, the research hypotheses were interviewed, and they were as follows:

First... The training load using hypoxic training positively affects the improvement of some functions and physiological variables for young middle-distance runners.

From the above, the researcher sees that the program applied to the experimental group by the method of hypoxic training that aims to improve the anaerobic capacity and the continuous one that aims to improve the anaerobic capacity was more effective and therefore has a positive effect, and this is confirmed by (Abu Al-Ela Abdel-Fattah, 1997, page 64), (Mohammed Othman, 2000, pg. 165), (Baha Salameh, 2002, pg. 97), (Ali Jalal El Din, 2004, p. 218) indicates that the process of rationing the training load forms the structure of the training programs in terms of intensity, size and comfort using. The coach puts it to reach his players to the phenomenon of physiological adaptation and thus raise the level of sports performance. The researcher returned these statistical differences to the extent to which the intensity of training loads affects the various physiological variables of

the athlete. The research sample has a gradual increase in the pulse rate after conducting a competition (experimental interview) in the dimensional measurement, as the increase in the physical load on the body's organs increases the need for a sufficient amount of oxygen to carry out the process of producing energy It is necessary to do the muscular work to face the physical loads, so the pulse rate increases to increase the amount of blood that is paid and loaded with oxygen. This is in agreement with (Ahmed Khater, Ali Al-Baik, 1996), (Abu Al-Ala Abdel-Fattah, Ahmed Nasr Al-Din, 2003), Muhammad Nasr Al-Din Radwan (1998 AD), (Baha Salameh, 2002), Hussein Dorri (2000 AD), Muhammad Othman (2000 AD). , (Ali Jalal Al-Din, 2004), that with the increase in the intensity of the physical load, the heart rate rises gradually until it reaches its maximum amount after performing the maximum physical load.

It was also an important development achieved by the experimental group in the indicator of lactic anaerobic capacity, one of the best physiological indicators. It is also used to evaluate the training load in sports activities and as an indicator of energy systems and intensity of performance (Kamal Abdel Hamid, Muhammad Sobhi Hassanein, 1997, p. 203).

It is clear from the previous studies that they agree with and support the findings of the researcher, which verify the validity of the first hypothesis.

Second... The proposed training program achieves a significant increase in the measurements of functional traits in the dimensional measurement, and thus the individual achievement of the junior middle-distance runners in favour of the experimental group ".

By comparing the results of the physiological tests of the two research samples in the post-test, the experimental group achieved remarkable progress in the level of aerobic and anaerobic capacity as a result of applying exercises to develop general and specific physical characteristics, in addition to applying exercises to develop anaerobic endurance more than aerobic endurance, which led to a significant improvement In the physiological capabilities, therefore, the development of achievement in the game of football depends on raising the level of these two types of prolongation with different ratios according to the level of sports.

5. Conclusion

The results of the post-test for the two research samples, whether in the physiological tests, show that all the differences between the averages of the results achieved a clear improvement in the physiological variables (Maximum anaerobic capacity (AC), Maximum rate of O2 consumption (VO2 max), Maximum Aerobic Speed (MAS)).

Within the limits of the procedures used and the results that have been reached, the researchers recommend athletics coaches to use hypoxic training to develop aerobic and anaerobic capabilities of runners at a distance of 800 meters.

References

Abdul-Ali, N., & Qasim , H. (1988). *Mabadi Etadrib.* Baghdad: Eriyadhi Higher Education Press.

Abu El-Ela , A.-F. (1997). *Physical training and physiological foundations* (Vol. 1). Cairo: Dar Al-Fikr Al-Arab.

Allawi , M., & Ratib , O. (1987). *Scientific Research in the Sports Field* . Cairo: Dar Al-Ishaa'a for Printing.

Allawi, M. (1994). *Ilm Etadrib Eriyadhi* (Vol. 3). Cairo: Dar Al Maaref.

Al-Rabadi, K. (1999). *El Jadid fi Alaab Elkiwa.* Jordan: University of Jordan.

Al-Rabadi, K. (2004). *Athletic Training for the Twenty-first Century.* Jordan: University of Jordan.

Bahaa , S. (2002). *Sports Health and Physiological Determinants of Sports Activity* (Vol. 1). Cairo: Dar Al-Fikr Al-Arabi.

Bassiouni, M. (2002 , January). The effect of developing aerobic and anaerobic abilities on some biochemical, physiological and digital variables for middle distance runners. *Scientific Journal of Research and Studies in Physical Education*(1).

Bastawisi , A., & Abbas , A. (1984). *Teaching Methods in the Field of Physical Education.* Baghdad: University of Baghdad.

Essam , A.-K. (2005). *Etadrib Eriyadhi Nadhariyat- Tatbikat.* Alexandria: Mansha'at Al-Maaref, Alexandria.

Hamdi, M. (2004). *The effect of developing anaerobic endurance on some physical, physiological and digital variables for 1500m runners.* Port Said: Faculty of Physical Education in Port Said, Suez Canal University.

Lamp, D. (1984). *Physiology of exercise responses and adaptation* (Vol. 2). New York: Macmillan publishing company.

Othman, M. (2000). *Training load and adaptation - biophysiological responses to stresses of training loads between theory and applied reality* (Vol. 1). Cairo: Arab Thought House.

Sebbane , M., Harchaoui , Y., Nacer , A., Abdadaim, A., & Remaoun, M. (2009). Approche théorique de l'expertise cognitive en sport. *Journal of Sport Science Technology and Physical Activities 6(6), 99-106., 6*(6), 99-106.

WACINECK , J. (1986). *Manuel entraînement.* Paris: Edition on Vigot, Paris.