
A comparative Study of Interval and Non –Uniform Training Methods on Aerobic Capacity-An Experimental Study Conducted on ES Tissemsilt Handball Club.

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Abstract

The study aimed to examine the effect of interval and non-uniform training methods on aerobic capacity in U17 handball players. Using the experimental method, 24 players from ES Tissemsilt were randomly assigned to two groups. Data were collected via the YO-YO Test and analyzed statistically. Results showed positive effects for both training methods on aerobic capacity, with no significant difference, although interval training showed relative improvement. The study recommends tailoring training programs to players' characteristics and using scientific assessment methods to monitor and improve aerobic fitness.

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1. Introduction:

There is no doubt that the tremendous development that has taken place in the field of sports training, through the latest scientific research and studies, highlights the importance and extent of the impact of physical effort on the aerobic capacity of handball players. This has made us realize the full truth of this, which shows that the more a handball player's ability to consume a greater amount of oxygen increases, the more his ability to produce energy increases, which enables the muscles to withstand physical exertion and continue to perform for as long as possible while maintaining a level of physical fitness. This is related to various physiological changes that occur in the body's functional systems. (Suliarno, 2024).

Therefore, efforts in the field of sports training science have made remarkable progress in helping athletes reach the highest levels. However, there are still other problems related to players' aerobic capacity, namely the extent to which players can withstand exertion and continue to perform for as long as possible while maintaining their level of physical fitness. This is considered one of the reasons for delays in physical fitness. This problem can only be eliminated by choosing the best and most appropriate training methods to improve the aerobic capacity of handball players. These problems are the responsibility of coaches and training specialists. Therefore, we turned our attention to the possibility of planning a training program using interval training and irregular training methods and their impact on the aerobic capacity of handball players.

The focus on the physical fitness of handball players has also contributed to the development of sports training methods and physical preparation, all of which is aimed at enabling each player to perform their duties and functions in their position to the fullest. In order for players to perform their functions, they must have a high level of the requirements of handball, which are represented in physiological, tactical, and skill factors and the extent of integration between them. (Henrique, 2024).

In order for players to perform their duties during a match, they must be able to sustain continuous effort throughout the specified time period. Endurance is linked to the player's functional fitness, as the body and all its cells need oxygen to oxidize energy substances, such as glucose, which is the primary source of energy needed for motor performance, especially with increased physical exertion and the body's increased need for oxygen to carry out chemical processes of construction and destruction. Considering all the functions in the body of a handball player, they are integrated with

each other in order to perform vital functions, which is why oxygen is necessary for various chemical processes. Hence, the problem of my study is to conduct a comparative study of the periodic training method and the irregular method on aerobic capacity. Based on this and to solve this problem, as a researcher, I see the importance of answering the following questions:

General question:

- Which of the two proposed training methods has a positive effect on improving the aerobic capacity of handball players?

Definition of concepts and terms:

Training program: “Defined as the operational steps in the form of detailed activities that must be carried out to achieve the objective. Therefore, we find that the program is one of the elements of the plan, and without it, the planning would be incomplete”. (Issurin).

Sports training: These are the trends and methods that aim to improve players' physical, technical, tactical, and psychological abilities so that they are able to exert the required effort in a professional manner and reach a higher level. (Bompa, 2021).

Aerobic capacity: Also known as the maximum oxygen consumption in physiology, is defined as the maximum volume of oxygen consumed in litres or millilitres per minute. To clarify this, if VO_{2max} is equal to three litres per minute, this means that this person can consume the maximum amount, which is estimated at about three litres per minute. The volume of this measurement is known as the maximum absolute oxygen consumption. (Poole, 2021).

Previous studies related to the topic:

First study: Study by Mohamed Tewfik Al-Wale Eli, entitled: "The Effect of a Proposed Training Program on the Skill Performance and Some Physiological Functions of Handball Players." The study aimed to identify the effectiveness of the proposed training program for the sample studied. The methodology used in conducting the study was experimental. The study sample was selected deliberately to include 85 male players aged 14 to 16 years old in Egypt who specialize in handball. The methods used included skill tests in handball (dribbling between cones, feints, etc.), while physiological tests (VO_{2max}) used a treadmill, and respiratory capacity was measured using a spirometer. One of the most important findings was that the proposed training program has a positive effect on some physiological functions and performance skills in handball.

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The second study: A study by Hind Abdel Razz, entitled: "Identifying Some Physical and Physiological Variables and the Level of Performance and Stability in Ballet for First-Year Female Students at the Faculty of Physical Education for Girls in Cairo." The study aimed to identify the effect of ballet training on some physical and physiological variables and the level of performance. An experimental approach was used. The sample consisted of 60 female students, 45 of whom were in the experimental sample at the Faculty of Physical Education in Cairo. The program lasted 12 weeks. The methods used included the Sargent test to measure muscle strength and the walking test to measure aerobic capacity. Among the most important results obtained was the positive effect of the plyometric training program on the muscular and physiological abilities of the sample studied.

Third study: A study by Qadri Saied Morsi, entitled: "The effect of training program planning on some physiological and physical variables of players on the national under-20 handball team participating in the African Championship in Algeria in 1986." An experimental approach was used. The sample consisted of 28 players under the age of 20, with four players for each playing position. The tools and devices used included laboratory tests for physiological and physical variables. One of the most important findings was the positive effect of the training program on some physiological and physical variables.

The fourth study: Ibrahim Mahmoud Garb's study, entitled: "The Effect of a Proposed Applied Program on the Development of Certain Elements of Physical Fitness and Skill Performance Level in Handball Players." The study aimed to identify the extent of the effect of the proposed applied program on the development of certain elements of physical fitness and skill performance level in handball players. The study sample was selected deliberately and included 40 male handball players under the age of 16 playing in the Egyptian league. The equipment used included skill performance and physical fitness tests, consisting of a 30-meter sprint from a standing start, a shuttle run between cones to test agility, and an 800-meter run to test VO₂max. One of the most important findings was the positive impact of the proposed program on all selected offensive skills.

The fifth study: A study by Bard Muhammad Ahmad and Sad entitled: "The effect of a training program on some blood components and physical fitness in young handball players." An experimental approach was used. The sample consisted of 30 junior players divided as follows: (15 players for the experimental sample and 15 players for the control sample, all male,

specializing in handball in Egypt). The methods used included the 30-meter shuttle run test, the 800-meter test (to measure VO₂max), a spirometer to measure lung capacity, and a Lactemie device. One of the most important findings was the positive effect of the proposed training program on certain physiological functions and blood components.

Comments on previous studies related to the topic:

In applying this study, I relied on a group of previous scientific studies related to my topic, which were applied to some physiological variables and physical fitness. These studies were conducted between 1990 and 2020. It is noticeable in all these previous studies that they used the experimental method to design proposed training programs and then judge their effectiveness after testing them. Some of them studied training programs with the aim of developing physical fitness elements at the skill performance level, as in the case of Mohamed Ibrahim Gharib, while others targeted the effect of training programs on certain physiological variables, such as Bard Ahmed Sad and Mohamed Tewfik Al-Wail. The sample was selected deliberately, and we found that the tests were subjected to direct measurement in laboratory devices such as treadmills and spirometers, in addition to some field tests such as 800-meter runs and 30-meter runs. Most previous studies have concluded that the proposed training programs had a positive effect in terms of improving and developing physical and physiological fitness. Based on the above, I have outlined some of the procedural steps that were applied during this study, such as: Selecting the research topic

- Selecting a sample that differs from previous studies in terms of height, weight, gender, study area, and training age.
- Determining the scientific methodology to be followed
- Developing hypotheses and objectives for the study
- Contributing to the design of the proposed training program, standardizing the training load, and familiarizing oneself with the statistical methods, tools, and devices used in the study that are consistent with the nature of the topic.
- Identifying the most important results reached in relation to those studies.
- The importance of previous studies in inferring from them during discussion and interpreting the results reached as a theoretical background on which to base this research.

Research methodology and field procedures:

1. Research methodology: An experimental methodology was used in my study, which is appropriate for the research question, namely a comparative study between interval training and non-interval training methods for improving the aerobic capacity of handball players. (Yuan, 2024).

Research community: The research community for the study consists of players from the Wafaq Tissemsilt Handball Club (U17), from the first regional championship of the Saida Association for the 2025/2026 sports season.

2. Research sample: “It is that part of the community that is selected according to scientific rules and methods that accurately represent the community” (Lofty, 2010). The research sample consisted of 24 handball players from the Wafaq Tissemsilt Club (U17), distributed as follows:

The two experimental samples consisted of 12 players for the periodic training method and 12 players for the irregular training method. The sample was selected randomly, and the training program was applied to the sample after being presented to a group of experts and specialists in the field of sports training in handball.

Research areas: These were as follows:

Time frame: The study was conducted according to the following timeline: The exploratory study was conducted on 21/09/2025 at 6:00 p.m. and repeated after (7 days) on 28/09/2025 to ensure the safety of the devices used and the suitability of the location for field application. Preliminary tests were conducted on October 7, 2025, on the experimental sample, and the program was then implemented from October 12, 2025, until January 12, 2026, with each training session lasting 60 minutes, at a rate of five sessions per week. It should be noted that the researcher conducting the study is also the team's trainer. The post-tests were conducted on 13/01/2026, applying the same tests under the same conditions as the pre-tests.

Location: The study was conducted in the Martyr Alouat Al-Tayeb Multipurpose Sports Hall in the municipality of Tissemsilt

Research tools: These included the following:

Scientific sources and references: These included scientific articles, books, journals, scientific conferences, and previous studies related to the topic.

Physical tests: These are considered one of the most important means of collecting quantitative data, especially in experimental research. Therefore, two field tests recommended by specialists in the field of sports training in

handball were used to measure the aerobic capacities and physiological aspects of the variables in this research.

Sports equipment: Handballs, cones, stopwatches, whistles, ladders, discs, rings, measuring tape, etc.

Devices used: Information and results recording form, Micro life blood pressure monitor, beep.

Measurements used in the research: Measurement of systolic and diastolic blood pressure and measurement of aerobic speed.

Description of tests:

First: Blood pressure measurement: This test aims to measure systolic and diastolic blood pressure in order to determine the athlete's health status and avoid any obstacles or injuries. The tools used include a micro life device and a stethoscope. The procedure involves the examinee sitting for at least five minutes before the measurement, relaxing, and wrapping the arm cuff above the elbow at a distance of approximately two centimetres for the left arm, then resting it comfortably, ensuring that the arm cuff is at the same height as the heart. The stethoscope is placed under the cuff, which is then inflated with air using a ball pump. The air is then slowly released for accurate measurement at a rate of 2-3 mm Hg per second, while reading the manometer and recording the first pulse, which is the systolic pressure and is within the normal range (100 to 130), as well as recording the last pulse, which is the diastolic pressure, which is within the normal range (60 to 80), avoiding any activity or eating immediately before the measurement, removing tight clothing from the arm, and ensuring that the shirt sleeves are not rolled up.

Second: YO_ YO Test to measure speed (maximum aerobic speed): This is a multi-stage running test that is usually applied by setting a distance (25 meters) with cones placed in three rows. The test consists of 21 endurance levels and 15 speed endurance levels. It is used with a running machine and software that contains audio instructions for the test, so that the sound of the voices accelerates at each level, requiring the athlete to increase their speed. It can be applied individually or in groups. This test aims to measure aerobic capacity by measuring the efficiency of the circulatory and respiratory systems (aerobic endurance), so that the athlete reaches a state of exhaustion or inability to continue performing. It is applied through a warm-up period of 5 minutes, with a timer, a suitable testing area, a compact disc containing the test program, a marked distance (20 meters and 5 meters, with each distance marked by cones), a results recording form, and an assistant team. This test has been approved by the

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Danish Football Association and the International Federation of Association Football (FIFA).

Presentation and analysis of results:

Post-test results for the two experimental samples:

Post-test results YO –YO Test:

Table 1: Shows the results of the post-test for the YO YO Test field test using the two proposed training methods.

Irregular training method			Periodic training method			Calculated “t”	Tabulated “t”	Degrees of freedom	Significance level	Statistical significance
Sample	Arithmetic mean	Standard deviation	Sample	Arithmetic mean	Standard deviation					
12	693.33	318.3	12	595	256.98	0.82	03.05	22	0.01	Not significant

Table (01): Shows the results of the post-test for the YO-YO field test using the irregular training method and the periodic training method, where the arithmetic mean was 693.33 and the standard deviation was 318.3 for the irregular training method, while the arithmetic mean was 595 and the standard deviation was 256.98 for the irregular training method. The calculated “t”-value was 0.82, which was smaller than the tabulated “t”-value of 03.05, at a significance level of 0.01 and a degree of freedom of 22, which shows us that there is no statistically significant difference between the two samples in the results of the post-test YO-YO Test.

Conclusion:

Table 1 show that there is stability and consistency in the level of the two experimental samples in relation to the post-test. The researcher attributed this to the ineffectiveness of the program and the two training methods used to train this sample during the training sessions, which do not push handball players to exert effort through the exercises provided, and thus the desired goal is not achieved, even though this stage is considered the most

appropriate stage for improving explosive strength, according to modern sports movement theories during late adolescence, which includes the best and most appropriate times for strength training because, In general, the growth process at this stage is mainly lateral, and we observe an increase in aerobic capacity, although there are differences between the various types of aerobic capacity.

Discussion of results with hypotheses:

Discussion of results: After the researcher collected quantitative (numerical) information using data collection tools and methods from testing and measurement tools in the mathematical field required by the research study variables, in addition to the statistical analysis program (SPSS), we concluded that there were significant differences in the arithmetic means of the post-tests for the research variables, which were in favour of the post-tests, as shown in Table 01 above. (brik).

There are statistically significant differences between the post-tests of the intermittent training method on improving aerobic capacity in the experimental sample.

There are statistically significant differences between the post-tests of the irregular training method on improving the aerobic capacity of the experimental sample. (Henrique J. R., 2020)

Through the results of statistical table (01), which showed statistically significant differences between the two post-tests, which were as follows:

The results of the YO-YO field test, which was estimated at 693.33 as the arithmetic mean for the irregular training method for the post-test and 595 as the arithmetic mean for the periodic training method for the post-test, while the calculated “t” was 0.82 and the tabulated “t” -value was 0.05 at a significance level of 0.01, indicating significant differences in favour of the post-test at the level of comparison between the arithmetic means of the two training methods, which was in favour of the periodic method, which had statistical significance in the relative development of aerobic capacity. Therefore: Through this discussion and analysis and the results obtained, it has been proven that there are statistically significant differences between the post-tests, which confirms the validity of the two hypotheses. In addition to the results of the study by Majid Tewfik Al-Wale Eli, which showed the effect of the proposed training program on skill performance and some physiological functions in handball, In addition, Bard Mohamed Saad's study showed that the proposed training program had a positive effect on some blood components and physical fitness for handball players.

Conclusions:

Through the results of the research and statistical analysis of the tests used in the study, the researcher reached the following conclusions:

- The effect of the proposed training program for both low-intensity interval training and irregular training methods on aerobic capacity.
- No significant differences in height, weight, and blood pressure tests.
- Statistically significant differences between the post-tests of aerobic capacity in the two experimental samples.

Based on the results obtained from the study, I recommend the following:

- Increase focus on developing and improving physical fitness factors to achieve good performance levels.
- Focus on the aerobic abilities of handball players when planning training sessions, especially for activities that require long periods of performance, without neglecting other physical qualities.
- The necessity of using standardized tests by coaches and specialists, given their importance in assessing the physical fitness of handball players.
- The need to apply physical tests from the beginning of the sports season during the physical preparation period in order to assess the progress and improvement of players, taking into account the need to reapply them from time to time to monitor, adjust and guide training plans.
- The need to work on integrating handball certificate holders, qualifying them scientifically, practically, and educationally to lead and supervise handball players, which is considered the basic foundation for progression in athletic levels.
- The need for coaches to choose training methods appropriate for each physical characteristic in order for athletic training to be truly effective.

One of the most significant problems currently facing handball is the pursuit of results, financial gains, and titles at the expense of training and talent, which have declined to low levels, in addition to the lack of the necessary skills to train young talent among those in charge of handball in Algeria. Therefore, the efforts that must be made to promote Algerian handball require specialists and those in charge of its affairs to pay more attention to the younger age groups and to create training schools, considering them the main reservoir for raising the levels of other categories. This is in order to prepare them in a systematic manner based on scientific principles in the field of sports training. Based on this vision, my scientific curiosity led me to research the impact of a proposed training

program for both interval training and irregular training on the aerobic capacity of handball players, considering that physical fitness is one of the most important aspects that improve athletic performance and enable each player to perform their roles on the field in the best possible way. Testing the appropriate training methods for each physical characteristic is also an important technique that coaches should be aware of in order to make the most of their time and effort to achieve the highest levels of performance. The research sample included the Wafaq Tissemsilt team for the U17 category, where physical fitness tests and measurements were conducted on them. Based on the statistical results, we found that there are statistically significant differences in aerobic capacity, which indicates the effectiveness and success of the proposed training program according to the two training methods proposed in the study.

References

- Bompa, T. O. (2021). *Periodization: Theory and Methodology of Training* (Vol. 2). (6, Éd.) Champaign, IL: Human Kinetics.
- brik, j. (s.d.). Effects of high-intensity interval training on aerobic and anaerobic capacity in Olympic combat sports: A systematic review and meta-analysis. *Frontiers in Physiology*, 65.
- Henrique, J. R. (2020). Effectiveness of HIIT on aerobic and anaerobic capacities and performance outcomes: meta-analysis. *Life*(15(8)), 180.
- Henrique, J. R.-C. (2024). High-intensity interval training programs and their impact on endurance performance in handball players: A systematic review. *Biomedical Human Kinetics*, 130–131.
- Issurin, V. (s.d.). Evidence-based prerequisites and conceptual models for training program design. (1. 1. 2021, Éd.) *Sports Medicine*(51(3)), 451–470.
- Poole, D. C. (2021). Critical power: An important fatigue threshold in exercise physiology. *Medicine & Science in Sports & Exercise*(53(6)), 1318–1334.
- Suliarno. (2024). Effect of high intensity interval training (HIIT) on VO₂max capacity of Bhayangkara FC U19 players. *Indonesian Journal of Physical Education and Sport Science*(4(3)), 294–302.
- Yuan, Y. (2024). Effects of high-intensity interval training on selected indicators of physical fitness among male team-sport athletes: A systematic review and meta-analysis. *PLoS ONE*, 19, e0310955.