The effect of high-intensity interval training on developing some biokinetics abilities, Electromyography (EMG), and the accuracy of shooting basketball

El efecto del entrenamiento en intervalos de alta intensidad en el desarrollo de algunas capacidades biocinéticas, la electromiografía (EMG) y la precisión en el tiro de baloncesto

Authors

Maryam Abd Ulrahman Hasham [1]
Hadeel talib Mohammed [2]
Alyaa Hussein Farhan [3]
Badra Malik Shiha [4]
Suhad Qassem Saeed Al-Mousawi [5]

[1, 3, 4, 5] University of Baghdad, (Iraq)
[2] University of Dijlah, (Iraq)

Corresponding author:
Suhad Qassem Saeed Al-Mousawi
suhad@copew.uobaghdad.edu.iq

How to cite in APA

Ulrahman Hasham, M. A., Mohammed, H. T., Hussein Farhan, A., Malik Shihab, B., & Saeed Al-Mousawi, S. Q. (2025). The effect of high-intensity interval training on developing some biokinetics abilities, Electromyography (EMG), and the accuracy of shooting basketball. *Retos, 70*, 1011–1022. https://doi.org/10.47197/retos.v70.116696

Abstract

Objective: Identify the effect of high-intensity interval training on developing some bio-kinetic abilities, Electromyography (EMG), and accuracy of layup performance in basketball, and the researchers hypothesized that high-intensity interval training has a positive effect on developing some bio-kinetic abilities, Electromyography (EMG), and accuracy of layup performance in basketball.

Research methodology: The researchers adopted an individual experimental group design with pre- and post-measurements. The training units were implemented over a period of (6) weeks, at a rate of (3) training units per week, lasting (90) minutes. This resulted in total of (18) educational units.

Results: Significant differences were found between the pre- and post-measurements of some bio-kinetic abilities, Electromyography (EMG), and the accuracy of basketball layup, in favor of the post-measurements and the experimental group. The researchers attribute these differences to the effectiveness of the HIIT method, as its use in training units and at high training intensities in a standardized and scientific manner led to an improvement in bio-kinetic abilities.

Conclusions: include the introduction of the high-intensity interval training method contributed effectively and positively to the development of some bio-kinetic abilities, Electromyography (EMG), and the accuracy of the basketball shooting performance of the experimental group members. The experimental group also showed significant superiority in the dimensional measurements of some bio-kinetic abilities, Electromyography (EMG), and the accuracy of the basketball shooting performance.

Keywords

High-intensity interval training; biokinetic abilities; Electromyography (EMG); accuracy; ladder shooting.

Resumen

Objetivo: Identificar el efecto del entrenamiento interválico de alta intensidad en el desarrollo de ciertas habilidades biocinéticas, la electromiografía (EMG) y la precisión en la bandeja en baloncesto. Los investigadores plantearon la hipótesis de que el entrenamiento interválico de alta intensidad tiene un efecto positivo en el desarrollo de ciertas habilidades biocinéticas, la electromiografía (EMG) y la precisión en la bandeja en baloncesto.

Metodología de la investigación: Los investigadores adoptaron un diseño experimental individual con mediciones previas y posteriores. Las unidades de entrenamiento se implementaron durante un período de (6) semanas, a un ritmo de (3) unidades de entrenamiento por semana, con una duración de (90) minutos. Esto resultó en un total de (18) unidades educativas.

Resultados: Se encontraron diferencias significativas entre las mediciones previas y posteriores de ciertas habilidades biocinéticas, la electromiografía (EMG) y la precisión en la bandeja en baloncesto, a favor de las mediciones posteriores y del grupo experimental. Los investigadores atribuyen estas diferencias a la eficacia del método HIIT, ya que su aplicación en unidades de entrenamiento y a altas intensidades de entrenamiento de forma estandarizada y científica condujo a una mejora de las capacidades biocinéticas.

Conclusiones: La introducción del método de entrenamiento a intervalos de alta intensidad contribuyó de forma eficaz y positiva al desarrollo de algunas capacidades biocinéticas, la electromiografía (EMG) y la precisión en el tiro de baloncesto de los miembros del grupo experimental. El grupo experimental también mostró una superioridad significativa en las mediciones dimensionales de algunas capacidades biocinéticas, la electromiografía (EMG) y la precisión en el tiro de baloncesto.

Palabras clave

Entrenamiento en intervalos de alta intensidad; habilidades biocinéticas; electromiografía (EMG); precisión; tiro en escalera.

Introduction

Basketball is a team sport with a unique character, as performing its skills requires certain qualities or abilities, whether morphological, functional, physical, or bio-kinetic, that may not be present in other games. Furthermore, it is a game characterized by constant and rapid changes in timing in motor performance, from offense to defense and vice versa. Bio-kinetic abilities are also vital, as the player is now able to run without deteriorating throughout the duration of the match (40) minutes. With a decrease in these abilities, the player becomes more susceptible to loss of concentration and rapid fatigue. Basketball players always need these abilities in order to maintain the same level throughout the match. Basketball is a team sport that requires high physical, motor, and skill effort due to the fast-paced offensive and defensive play, which requires precision in the execution of skills, including shooting. In this game, players strive to enhance their physical, motor, and skill capabilities. The primary goal of attack in basketball is the accuracy required for each shot toward the basket. Shooting is executed in various ways, depending on the player's position on the court, their position relative to the opponent, and the space that allows the player to execute quickly. Shooting is the process of propelling the ball toward the target in the form of a throwing motion using one or two arms. Furthermore, it is the foundation that crowns all processes that occur in the game, through which the team can achieve victory (Al-Nedawy & Saeed Al-Mousawi, 2022). Shooting in basketball relies on high accuracy, as each sporting skill has a goal, depending on the type of skill, the type of activity practiced, and the rules specified for it. Accuracy requires directing voluntary movements with high efficiency from the the muscular and nervous systems. Therefore, the nerve signals sent to the muscles from the nervous system must be precisely directed so that movement is carried out in the desired direction with the precision necessary to hit the target (Alyaa, 2023).

Sources also indicate that the more efficient the control process is in producing the exact amount of force required, the more precise and economical motor performance will be. This is because the nervous system mobilizes motor units to participate in muscle contraction depending on the amount of resistance the muscle faces, whether weight or distance. A player does not necessarily need to produce 100% force. This depends on the information the central nervous system receives via sensory neurons, which directs the body's various movements by sending its commands in the form of nerve signals via motor neurons (Abdul-Fattah, & Nasr Al-Din, 2003) (Mohammed, &. Saeed, 2021).

Basketball shooting accuracy is one of the most important skill performance requirements, representing the culmination of effective performance of game skills linked to muscular strength. Effective training approaches are used to develop this important performance requirement, as shooting is the ultimate outcome that enhances successful basketball skill performance. Scientific training approaches, using appropriate training methods and exploring new and more appropriate approaches, lead to improved performance levels and keep pace with the intense competition between teams competing in this game. Bio-kinetic abilities have a biological background and are evident in motor performance. Therefore, their name includes both the bio-segment and the motor segment. These abilities are important for successful motor performance, and the dominant ability among them is what is required for the performance of a game or sporting event. The importance of bio-kinetic abilities lies in their representation of physical fitness, consisting of a set of physical attributes, physical abilities, and motor abilities. These abilities do not appear separately during performance, but rather appear in the form of interconnections and interrelationships, and they form the basis for the performance of skills in games and sporting events, including basketball (Abdul Aoun, 2022). The training process aims to try to get the player to the highest level of motor performance. We find that there are different training methods, and among these important methods is the method of high-intensity interval training, which is a training system, characterized by successive exchange between effort and rest. The word interval refers to the rest period between each training session and the training session that follows it (Saghir, 2021)., in addition to its being the second type of interval training, and is considered one of the most important training methods that work to develop the general and specific physical characteristics specific to each activity and the maximum energies of the player. High-intensity interval training is characterized by increased training intensity and relatively small volume. (Hussein Farhan et al, 2025). The method of high-intensity interval training is characterized by increased training intensity and relatively small volume. The volume of exercises must be proportional to the intensity used, but in general, the volume must be small due to the high intensity. As for rest, it is necessary to return to the heart rate as a true standard for using rest. Rest

periods must not exceed (160 seconds) or when the heart rate reaches (120-130) beats per minute, after which the player begins the other repetition. Therefore, this method leads to developing the muscles' ability to adapt to physical exertion, which leads to a delayed feeling of fatigue. (Al-Bishtawi & Al-Khawaj, 2005).

Electrical muscle stimulation is a stimulus sent in the form of electrical waves to the nerve fibers to excite them. This excitation is transmitted to the muscle fibers, causing the basic response of movement (muscle tension), ultimately forming the basic requirements for muscle contraction. (Abdul-Karim, 2009)

It is no secret to those who follow basketball at the university level in Iraq that the game's level, both nationally and internationally, has declined in terms of bio-kinetic abilities and skill performance, particularly shooting, which has been reflected in the results of these teams. Researchers may attribute this to the lack of adoption of training curricula based on modern, planned scientific foundations that keep pace with the game's developments, theories, and modern training methods. This is in addition to the lack of interest in training the skills associated with the skill of shooting, and the activity or Electromyography (EMG) associated with this performance. This negatively affects the effectiveness of training for this game. The specificity of training requires that coaches develop appropriate training curricula to develop the game and ensure that they match the accuracy of skills. This has prompted researchers to shed light on this research problem and attempt to solve it by developing a training method, namely high-intensity interval training, and to identify its effects on some bio-kinetic abilities, Electromyography (EMG), and the accuracy of shooting in basketball.

Research objective

- Identify the effect of high-intensity interval training on developing some bio-kinetic abilities, Electromyography (EMG), and accuracy of layup performance in basketball.
- The researchers hypothesized that high-intensity interval training has a positive effect on developing some bio-kinetic abilities, Electromyography (EMG), and accuracy of layup performance in basketball.

Research hypotheses

- There are statistically significant differences between the pre- and post-tests, in favor of the post-tests, in developing some bio-kinetic abilities, Electromyography (EMG), and the accuracy of basketball shooting.

Method

Research Methodology

The researchers adopted the experimental research method with a single-group design with pre- and post-measurements. The population was represented by the players of the University of Baghdad basketball team participating in the Iraqi University Basketball Championship for the academic year (2024/2025) (14) players, with the sample percentage of the population reaching (82.35%). (10) players were selected to represent the research sample after being selected, while the other 4 players were used for the pilot sample. To determine the homogeneity of the sample members, the researchers used height, weight, and age measurements. The value of the skewness coefficient ranged between (-+3). The results indicated that the sample was homogeneous, as shown in Table (1). One of the things that the researcher must determine accurately is choosing a sample that accurately represents the original population.

Table 1. Shows the arithmetic means, standard deviation, and skewness coefficient for sample homogeneity.

Variables	Measuring unit	Mean	Median	Std. Deviations	Skewness
Chronological age	Year	15.87	16.00	0.67	0.23
Height	Cm	170	169	0.74	0.54
Mass	Kg	67.25	67.50	0.43	0.98

To measure some bio-kinetic abilities, Electromyography (EMG), and the accuracy of performing a ladder shot with a basketball among the research sample members, the researchers relied on standardized and used tests that were applied to the same specifications of the current research sample. To extract the apparent validity of the tests of some bio-kinetic abilities, Electromyography (EMG), and the accuracy of performing a ladder shot with a basketball, they were presented to (11) experts and specialists through a questionnaire specifically for this purpose in the field of basketball, testing, and measurement. They expressed their approval of all the tests at a rate of (100%). To verify the stability of the tests, the test-retest method was adopted. The first application of the tests was on 3/6/2025 in the closed sports hall at the College of Physical Education and Sports Sciences - University of Baghdad. After (5) days, the second application of the tests was carried out, i.e. on 3/11/2025 and in the same place. The correlation coefficient was calculated between the scores of the first application, and the values of the stability coefficient for all the tests appeared to be high values indicating their stability. As for the objectivity of the tests, they are high because the tests are specified by grades and instructions that two people do not disagree on. Pre-measurements of some bio-motor abilities, Electromyography (EMG), and accuracy of shooting a basketball ladder were conducted for the experimental research group at ten o'clock in the morning in the indoor sports hall at the College of Physical Education and Sports Sciences - University of Baghdad on 3/13/2025.

Data Collection Methods, Tools, and Devices Used

Data Collection Methods

- Arabic and foreign sources and references.
- Observation and personal interviews.
- Testing and measurement.
- The World Wide Web (the Internet).
- Test results recording form.
- Expert opinion survey form regarding research variables.

Devices and tools used in the research:

- A legal basketball court.
- 30 basketballs.
- A measuring tape.
- A stopwatch for measuring times.
- A Myo Trace 400 EMG device (Bluetooth) (1 Noraxon Inc. USA)
- A Japanese-made Lenovo laptop and device software.

Defining Research Variables and Tests

Defining research variables is one of the important practical procedures in physical education research that researchers resort to accordingly, the researchers developed physical and motor tests and exercises based on scientific sources and references, and consulted experts and specialists in the field of volleyball for their opinions and guidance. This resulted in identifying physical and motor abilities that were compatible with the research problem. The tests were supervised by the coach and assistant coach, and were conducted indoors.

Test 1: Throwing a 2 kg medicine ball with both hands overhead from a seated position on a chair (Jawad et al., 2025).

Test 2: Flexing and extending the arms from a forward leaning position for 10 seconds (Abdelkarim & Al-Mousawi, 2025). Speed-Distinguished Strength (for Legs)

Test Three: Zigzag Running Between Signs (Almusawi DS, 2019)

Test Four: Ladder Shooting Test

Test Five: Electromyography (EMG) (Abdullah Mohsen et al., 2025)

The purpose of the test is to measure the electrical activity of the target muscles during the performance of a bench press at an intensity of 90% of the maximum effort for each quadrant, for three repetitions. Each time, the electrical activity of one of the target muscles is measured using a wave peak indicator.

Tools Used: The researcher used a four-electrode EMG device, Model 400 1.07.41 Edition (supported by the manufacturer) using Myotrace (MR3) software, and a personal computer (laptop).

Performance Description: The sensors are attached to the center of the targeted muscle after removing hair and any obstructions on the outer skin of the muscle. This device receives the electrical signal emitted by the muscle via wires connected to the sensors attached to the muscle. This device sends an EMG signal in the form of a PC Interface Model to a Bluetooth receiver.

Recording Method: The data received is recorded on the computer while performing the bench press.

Exploratory Experiment

In order to assess the research steps, ensure the appropriateness of the proposed time period for the training module, ensure the proper functioning of the devices and tools, and determine the validity of the measurements and tests used in the research and the extent of the researchers' and the team's ability to perform and implement them, the researchers conducted a preliminary pilot experiment on a sample of (4) individuals from the research sample. The objectives of the experiment were:

- To determine the success of the tests and the validity of the devices, tools, and support staff.
- To identify any difficulties the researchers might encounter while implementing the exercises.
- To conduct a training module to determine the time and frequency. The adequacy of rest periods used for the sample was ensured.
- Ensure the time used for exercises was sufficient and that the exercises were appropriate for the research sample.

Pre-tests

The researchers conducted the pre-tests on March 13, 2025, at 3:00 PM, in the Police Club's indoor hall. The pre-tests were administered to the research group. The pre-tests were administered after the test was explained to the research sample to obtain all variables through performance.

Trainings used in the research

The training exercises for the research were developed according to a set of criteria and principles

- The training method used was high-intensity interval training.
- The proposed training content was consistent with the set goals and the nature of the age group.
- Taking into account individual differences among players.
- Determining the duration of the training unit.
- Considering the progression from easy to difficult within the training unit.
- The training program included 30 training units, equivalent to 10 weeks in three training units.
- Load oscillations: 3/1
- Training days: Saturday, Monday, and Wednesday.
- Determining the scientific foundations for the components of the training load in terms of (intensity, volume, and rest).
- The duration of the training unit was 90 minutes.
- Anaerobic and high-intensity training were developed.

After completing the training modules using the high-intensity interval training method, post-test measurements of some bio-kinetic abilities, Electromyography (EMG), and the accuracy of basketball shooting were conducted on April 24, 2025, at 10:00 a.m., in the indoor sports hall of the College of Physical Education and Sports Sciences at the University of Baghdad, in the presence of the support team. The researchers took into account the circumstances and conditions under which the pre-test measurements were conducted.

Post-tests

After the training period concluded, the post-test was conducted on the research sample on April 24, 2025, at 4:00 PM. The researchers took into account the same conditions as the pre-test in the laboratory. The researchers ensured the same conditions for the test in terms of time, location, support team, and tools and equipment to ensure that the variables were as consistent as possible.

Statistical Methods

The researchers used the Social Security System (SPSS).

Findings

Presentation, analysis of the results

The results are shown in Tables 2, 3, and 4.

Table 2. Shows the calculated t-value between the pre-test and post-test measurements of some bio-kinetic abilities in basketball for the experimental group.

No.	Tests	Unit of measurement	Arithmetic mean of difference	Standard error of the mean difference	T value Calculated	Type Sig
1	Explosive power	Watt	1864.32	326.71	5.706	Sig
2	Distinctive strength of speed	Meter	0.89	0.2153	4.133	Sig
3	Kinetic speed of the legs	Count.	2.93	0.683	4.289	Sig
4	Agility	Second	3.26	0.587	5.553	Sig

The difference is significant if the calculated t-value is greater than its tabular value of (2.36) at a significance level of (0.05) and with a degree of freedom of (9).

Table 3. Shows the calculated t-value between the pre- and post-measurements of the electrical activity of the most important muscles involved in the basketball layup for the experimental group.

No.	Tests	Unit of measurement	Arithmetic mean of difference	Standard error of the mean difference	T value calculated	Type Sig
1	Peak electrical activity of the rectus femoris muscle	Microvolt	458.92	118.34	3.877	Sig
2	Peak electrical activity of the gastrocnemius muscle	Microvolt	256.75	52,.36	4.905	Sig
3	Peak electrical activity of the triceps brachii muscle	Microvolt	194.64	29.23	6.659	Sig
4	Peak electrical activity of the deltoid muscle	Microvolt	374.91	85.48	4.386	Sig

The difference is significant if the calculated t-value is greater than its tabular value of (2.36) at a significance level of (0.05) and with a degree of freedom of (9).

Table 4. Shows the calculated t-value between the pre- and post-measurements of the electrical activity of the most important muscles involved in the basketball layup for the experimental group.

No.	Variables	Unit of measurement	Arithmetic mean of difference	Standard error of the mean difference	T value Calculated	Type Sig
1	Shooting accuracy	Degree	4.79	1.25	3.832	Sig

The difference is significant if the calculated value of (t) is greater than its table value of (2.36) at a significance level of (0.05) and under a degree of freedom of (9).

Discussion

Based on the results presented in Tables (1, 2, 3, 4, 5, and 6), there were significant differences between the pre- and post-measurements of some bio-kinetic abilities, Electromyography (EMG), and the accuracy of basketball shooting, in favor of the post-measurements and the experimental group. The researchers attribute these differences to the effectiveness of the high-intensity interval training method. Using it in training units and at high-intensity training intensities in a standardized and scientific manner led to an improvement in biokinetic abilities. This was confirmed by the fact that the method of raising or increasing intensity during a training unit or training phase is considered an important method that coaches must focus on when using it in training, as it increases the athlete's ability (Hussein Kadhim, et al., 2025). The researchers also attribute these differences to the effectiveness of the exercises used in the training units, which directly affected the neuromuscular system. These units took into account the type of biokinetic abilities to be improved. This is consistent with what was stated in that biokinetic abilities are the basic abilities that have Specific responses to the training process, which constitute the components of physical fitness and influence how the body moves, are all inherited and acquired physical activities that play an influential role in reaching higher levels of achievement. (Abdullah Mohsen et al., 2025)

The demands and difficulties of playing basketball, especially when playing in a confined space, require a high degree of balance and coordination. This was evident in the use of competitive exercises, which had a significant and clear impact on developing their motor skills, which was reflected in developing their peaceful shooting skills. On the other hand, the use of resistance when performing exercises, in a movement similar to the performance of the activity, had an effective role in the muscles on the opposite side, which work to recruit the largest possible number of motor units to compensate for the weakness in them so that the weightlifter can perform the required motor task. Here, it must be noted that the mass lifted for both sides is the same, which shows that the muscles on the opposite side need to recruit more motor units in order to achieve strength equality with the muscles of the stronger side, which perform the same motor task with fewer motor unit recruitment. This is consistent with what was stated by both Sarih Abdul Karim Al-Fadhli and Abdul Razzaq Jabr Al-Majidi, that the correct mechanics of muscle work means using a smaller number of muscle fibers with high economy, which means that the result of the physiological benefit will be more economical, which means a high mechanical result. Therefore, the muscle will be less electrically effective, given that there is economy in performance, unlike when the muscle is under a mechanical situation (T. Bompa, 2016).

The researchers also attribute the significant differences between the pre- and post-Electromyography (EMG) measurements to the fact that the systematic use of high-intensity interval training helped recruit the largest number of motor units of the involved muscles during the basketball layup. Through this method, the working muscles experienced a significant increase in Electromyography (EMG) of the muscle during the basketball layup. This is consistent with what has been indicated, the physiological reason for the increase in Electromyography (EMG) when the strength of muscle contraction increases is the increase in the number of motor units involved in this contraction, as well as the increase in their synchronization during the contraction (Electromyography (EMG) is also distinguished by its ability to recruit all muscle fibers for contraction simultaneously, which does not occur during voluntary contraction. Always a portion of muscle fibers has not yet contracted. This portion is called reserve strength. This aligns with what was stated, Electromyography (EMG) stimulates the largest number of motor units in muscle action, thus producing a higher force output, because it relies on stimulating muscle fibers to the maximum degree, just as exposing a muscle to great resistance requires stimulating the largest number of units. (Diana & Suhad , 2020).

The mechanism of action and application of training exercises has been developed scientifically by forming their types according to the training goal, which is to reach a distinctive level of physical fitness for this category and to enjoy physical health that suits the biological age of the sample, to the effectiveness of special exercises and Electromyography (EMG) in affecting the muscles on both sides of the body, especially the weaker muscles, and the ability to develop them in stimulating and recruiting a greater number of motor units, as the special exercises developed by the researcher worked to increase the muscle's investment in the values of internal recruitment, which led to an increase in the output of muscle strength and its approach to the muscles of the stronger side in the percentage of recruitment of motor units (Alyaa & Suhad, 2022)

The researchers also attribute the significant differences between the pre- and post-measurements of basketball shooting accuracy to the fact that the high-intensity interval training method applied by the experimental group during the special preparation phase succeeded in employing the resulting biokinetic adaptations to increase the accuracy of skill performance, represented by increasing the efficiency of the muscles working during shooting, reflecting the importance of skill training and improving biokinetic abilities (Shahab Ahmed, & Saeed Al-Mousawi, 2025). These abilities must be present in various forms and quantities, and must be compatible with the accuracy of basketball shooting and similar to the motor paths of this skill in order to achieve its intended benefit. This aligns with what was stated. It was pointed out that using exercises that are consistent in their performance nature with the general form of specialized skill performance leads to better results in gaining accuracy. (Abdul-Fattah & Nasr Al-Din, 2003).

And continuing with these training loads makes the muscle stronger as a result of the adaptations that occur in these fibers which in turn works to improve muscle balance through the ability of the nervous system to send nerve impulses to produce equivalent muscle strength for the muscles on both sides of the body to overcome different resistances with perfect fluidity and muscle motor coordination (Abdullah Mohsen et al., 2025), and the rates of development in the values of electrical activity of the muscles on both sides of the body appear at high rates, i.e. an increase in the recruitment of motor units in the post-test, and this increase that occurred came in harmony with the increase in the muscle's ability to lift a larger mass (Shabib & Al-mousawi, 2023).

The researchers also attribute the high-intensity interval training method to several characteristics that contributed to the development of some bio-kinetic abilities, Electromyography (EMG), and accuracy in basketball shooting performance among the experimental group. This is consistent with what some relevant sources have stated, stating that the high-intensity interval training (HIIT) method is considered one of the effective training methods for improving the physical and skill performance of basketball players, particularly in developing bio-kinetic abilities and shooting accuracy, including the ability to change directions, speed, and muscle strength. (Al-Jamal, 2023) Strength and speed training have become an important part of throwing training, especially modern throwing. Strength and speed training methods and equipment have evolved, becoming the most important part of training in terms of their direct and significant impact on performance. To achieve success and reach the highest levels (Badwi, ,& Saeed , 2023), we must innovate new methods using modern technical means and not cling to and adhere to old methods and working methods. This is achieved through the development of the athlete's abilities and capabilities, as well as by changing the grip of the spear to make performance more difficult (Almusawi DS. 2019). Therefore, in addition to sports training, advanced equipment is involved in forming and developing capabilities that the athlete adapts to and trains on in various circumstances. When training on muscular strength using special strength, it is taken into account that it is consistent with competition exercises in its composition and in the timing of the force release. Special strength exercises are characterized by exercises to strengthen a muscle or (specific muscles) whose use differs in another activity (Abdulsalam Sabri et al., 2025), and exercises to strengthen (the most important muscles involved in the specialized activity). These exercises work to improve the coordination between the working muscles, in addition to improving the mutual relationships between the basic working muscles and the nullifying (preventing) or auxiliary muscles, with this being linked to the factor of muscular development and strengthening. Training conditions must be similar to the conditions of the match (sports competition) or higher than them. To obtain the highest effective level of training, the coach must subject the player to various forms of training. This diversity in training through the training units that the players implement is what created adaptations to perform skills with mastery. These exercises work to improve the coordination between the working muscles, in addition to improving the mutual relationships between the basic working muscles and the auxiliary muscles confirms. (Saeed, Khalifa, & Noaman, 2019) Quoting Ori Alexander, Training achieves many physiological effects within the body, represented by improving the functional efficiency of the body's various systems. The exercises that were prepared were intended to develop the working muscle groups and the characteristics of the strategies used, as their degree is linked to the sudden and rapid decrease in the training load in terms of the cooling-off period or its time. Therefore, it did not achieve the retention of training adaptations and physical training gains. (Shabib & Al-mousawi, 2023). Sports training of various types is the tool) (Parvez, 2021). This process is closely related to the intensity and duration of the physical effort, and these changes appear in the form of physiological adaptation, so we call it physical training (Badwi, et al., 2023). The

researcher paved the way for the preparation of physical exercises. Preventatively, then incorporate physical exercise (explosive force with defensive movements during the special preparation period or through exercises related to the game skills exercises were appropriate to the level of the research participants, were built on correct scientific foundations, and were properly implemented by the training coaches and the players. In addition to this, these exercises included more than one physical attribute at one time during the performance (Al-Nedawy & Saeed Al-Mousawi, 2022) To load the training in terms of the cool-down period or its time, and therefore did not achieve the retention of training adaptations and physical training gains (Suhad , 2022) It has proven that the use of training means and equipment has a Positive role in sports training By using a group of muscles in the body, which in turn leads to the development of strength, because these muscles have a major role in performing skills (Alyaa & Suhad, 2022)

It is preferable to use the high-intensity interval training method to develop some bio-kinetic abilities, Electromyography (EMG), and the accuracy of performing the basketball layup. It is also used as an effective approach in basketball player preparation programs, especially during special preparation periods to develop technical and physical performance, with the possibility of combining it with Electromyography (EMG) to achieve faster and more sustainable results (Morad, & Shbeeb 2023). In addition, it is necessary to pay attention to high-intensity training for its clear role in the accuracy of performing the basketball layup. It is also important to emphasize the importance of focusing on using exercises using the high-intensity interval training method similar to specialized performance to maintain coordination and muscle arrangement while performing the basketball layup skill to raise its accuracy level. Finally, it is necessary to conduct more studies on samples of different ages, genders, and skill levels. Training conditions should be similar to or higher than those of a match (sports competition) to obtain the highest effective level of training. The coach must subject the player to various forms of training. This diversity in training through the training units implemented by the players is what created adaptations to perform skills with mastery. These exercises work to improve the compatibility between the working muscles, in addition to improving the mutual relationships between the main working muscles and the auxiliary muscles. (Saeed et al., 2019) (AL-Musauy et al., 2022), quoting Ori Alexander, confirms training achieves many physiological effects within the body, represented by improving the functional efficiency of the various body systems. The exercises that were prepared were intended to develop the working muscle groups and the characteristics of the strategies used, as their degree is linked to the sudden and rapid decrease in the training load in terms of the cooling-off period or its time. Therefore, it did not achieve the retention of training adaptations and physical training gains. (Suhad, 2022) (Rand, & Suhad, 2022). Sports training, in its various types, is the only tool that has a clear role in the sports training process. And translating it to serve the desired goal, as the coach is an artist in choosing the method, training equipment and means appropriate to the type of sport in which he works, which can be used with the rest of the other methods in order to develop and improve any element in the elements of physical fitness and to achieve what should be achieved.

Conclusions

- The introduction of high-intensity interval training (HIIT) contributed effectively and positively to the development of some bio-kinetic abilities, Electromyography (EMG), and the accuracy of basketball layup performance for the experimental group.
- The experimental group demonstrated significant superiority in dimensional measurements of some bio-kinetic abilities, Electromyography (EMG), and the accuracy of basketball layup performance.

Recommendations

- Using high-intensity interval training to develop some bio-kinetic abilities, Electromyography (EMG), and the accuracy of basketball layup performance.

- HIIT is an effective approach in basketball player preparation programs, particularly during special preparation periods to develop technical and physical performance. It can also be combined with Electromyography (EMG) to achieve faster and more sustainable results.

Acknowledgements

Non.

Financing

Non.

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Authors' and translators' details:

Maryam Abd Ulrahman Hasham	maryam.a@uobaghdad.edu.iq	Author
Hadeel Talib Mohammed	hadeel.talib@duc.edu.iq	Author
Alyaa Hussein Farhan	Alia.h@uobaghdad.edu.iq	Author
Badra Malik Shiha	badraa.m@uobaghdad.edu.iq	Author
Suhad Qassem Saeed Al-Mousawi	suhad@copew.uobaghdad.edu.iq	Author