

The effect of HIIT training on some functional indicators and straight punch speed endurance for young boxers weighing 57-63 kg

Dr. Haidar Abd Ali Hamza

University of Karbala / College of Physical Education and Sports Sciences/Iraq.

Corresponding author: haidar.a.ali@uokerbala.edu.iq

Abstract

Boxing training is characterized by strength and speed, meaning a high ability to perform offensive and defensive movements. Boxing requires high physical preparation and scientifically codified training for the purpose of raising the physical capabilities of the boxers to complete the fight, especially at the end of the second and third round. This requires the efficiency of the circulatory and respiratory systems, and it also requires the safety and efficiency of the nervous system for what it needs. Boxing with high concentration while maintaining high energy levels throughout the fight.

Therefore, the research study aimed to use high-intensity training for the purpose of developing the physical efficiency that a boxer needs, especially the maximum anaerobic capacity, because the dominant system is the anoxic system (lactic), as well as the enzymes that directly affect this system (LDH.CAT) and carry the speed of the straight punch of young boxers. The researcher used the experimental approach with two equal groups. The research sample was represented by young boxing players in the Iraq Club in Karbala Governorate, who numbered 10 boxers weighing 57-63 kg. High-intensity training (HIIT) was applied to the research sample at a rate of three units per week and at a rate of 30 training units. Through it, the training intensity was regulated to suit the nature of the method followed and the intensity of the fight. After that, post-tests were conducted for the research variables. The researcher used the statistical program SPSS to extract the research results, from which the researcher concluded that HIIT training had a significant impact on the variables investigated (maximum anoxic capacity, speed endurance). The straight punch and the LDH.CAT enzyme. In light of this, the researcher recommends the necessity of following training with intensity similar to the fight environment in order to adapt the boxers' functional systems and to avoid a rapid decline in the boxers' level during the fight.

Keywords: HIIT Workouts , Functional Indicators and Straight Punch Speed Endurance.

Introduction

Training science is considered one of the sciences that is largely based on other sciences and is complementary to the modern training process through conducting laboratory and field experiments. Physiology is one of the important and basic sciences for advancing the reality of training by revealing the effects of training and the level of development of the body's functional systems, as well as the work of glands and enzymes and the effect of each of them. In physical effort and energy expenditure, as well as the major role in regulating stress, the

safety of players, and achieving great training results, especially in games with high intensity, and because the game of boxing is one of the games whose exercises are characterized by relatively high intensity, it is accompanied by large accumulations of lactic acid and energy waste such as lactate salts and free radicals,¹ so it requires that the exercises be Constructed and codified in a sound and scientific manner, it effectively contributes to the occurrence of real adaptations and planned time periods, in addition to proper nutrition. The game of boxing, which is one of the games that requires a very great effort, and this prompts those in charge of this sport to choose exercises that suit the type of intensity, because the body's responses to high stress give the boxer Adapting to the nature of performance in terms of increasing energy stores or resisting the accumulation of lactic acid in the muscles.²

Hence the importance of research through the use of high-intensity training (HIIT) in a playing environment similar to the fight in terms of intensity, type of exercise, and the energy system prevailing in the fight for young boxers.

Research problem

The ability of the athlete to continue performing skills and to withstand fatigue during physical effort requires correct training that is appropriate to the intensity to which the athlete is exposed in tournaments. One of these games is the game of boxing and the high physical abilities it requires. Through the researcher's follow-up of most of the boxers in the tournaments held by the Central Federation, he noticed that there is a weakness. In the physical fitness of many boxers, this is what prompted the researcher to use high-intensity training (HIIT) for the purpose of building functional adaptations that suit the intensity to which the boxer is exposed during the fight and to increase the boxers' tolerance for accumulations of fatigue resulting from the increased concentration of lactic acid in the blood.

Research objectives

1. Preparing high-intensity training (HIIT) for young boxers weighing 57-63 kg.
2. Identify the effect of HIIT training on some functional indicators and straight punch speed endurance for young boxers.

Research hypothesis

- HIIT training has a positive effect in developing some functional indicators and endurance of straight punch speed for young boxers weighing 57-63 kg.

Field of research

- Human field: Young boxers at the Iraq Club in Karbala Governorate, 2023 AD
- Time frame: for the period from 7/1/2023 until 10/15/2023.
- Spatial field: The Iraq Boxing and Kickbox Club hall and ring. And Elite Laboratories for Medical Analysis in Karbala Governorate.

Research Methodology

The researcher used the experimental method with two equal experimental and control groups with a pre- and post-test to suit the nature of the research work.

The research community and its sample

The research community was determined by the young boxers in the Iraq Club for the 2023 season, which numbered 10 boxers. The sample was divided into two groups (experimental and control), with five boxers for each group.

- **Homogeneity and equality of the two research groups**

Table 1. Shows the arithmetic mean value, the standard deviation, the calculated Levene and T values, and the significance level of the research variables

Variables	Experimental group		Control group		F value	Calculated (t) value *	Sig	Indication
	mean	Sd	Mean	Sd				
Anoxic capacity	34.78	1.91	35.46	1.33	1.03	0.65	0.53	Insignificant
Endurance the speed of a straight punch	128.80	4.14	126.60	3.91	0.038	0.863	0.41	Insignificant
LDH enzyme	259.08	7.20	256.40	8.94	0.567	0.522	0.61	Insignificant
CAT enzyme	447.52	16.16	452.28	9.73	0.379	0.564	0.59	Insignificant

*At a significance level of (0.05) and a degree of freedom of 8.

It is clear from the table above that the research variables are random between the experimental and control groups.

Field research procedures

Determine search tests

First : Maximum anaerobic capacity

- Wingate .³
- Test objective: Measure maximum anaerobic capacity.
- Steps to implement the test.
 1. The laboratory mass is taken.
 2. Warm up on the bike for (3-4) minutes with a resistance of 1-2 kg, depending on the weight of the subject. Before the end of the warm-up, the subject moves the bike wheel at maximum speed for 3-5 seconds and repeats this two to three times in succession.
 3. The subject’s data is entered into the computer and the resistance is set according to the subject’s weight, which is equivalent to 7.5% of his body weight.

4. The weight is removed from the weight basket, and the subject begins to move the bicycle wheel at the maximum possible speed, at a speed of not less than 80 revolutions, for a period not exceeding three seconds. After that, the weight is gently lowered, and at the same time the start program button is pressed to begin the measurement process, and the subject continues to move the wheel for a period of time. 30 seconds, provided that he is encouraged and urged to maintain the rotation speed as much as possible.
5. Register: The results are recorded directly through a program installed in an electronic calculator for the purpose of calculating variables.

Second: Biochemical tests

1. LDH-CAT enzymatic measurement .⁴
2. After the research sample is warmed up for five minutes on the treadmill, the physical stress test begins by increasing the speed of the device to 15 km/hour for two minutes, after which the effectiveness of the enzyme is measured after a five-minute rest, using a German-made device and according to the instructions (kit) for each. A test to give the required results, knowing that its normal percentage is (226-351 U/L).

Third: Straight punch speed endurance test

- Purpose of the test: to measure the speed endurance of a straight punch.
- Performance method: The boxer stands in front of a wall cushion, and at the start signal, the boxer directs straight punches towards the cushion for 40 seconds.
- Recording: The number of correct punches is counted only during the 40 seconds.

Pretests

The pre-tests were conducted on Thursday, 3/7/2023, and at five o'clock in the afternoon, starting with speed endurance tests, after which functional tests were conducted (maximum anaerobic capacity and the enzymes LDH and CAT. Blood samples were drawn from the boxers to measure the levels of enzymes after the effort, that is, after conducting a test. It was carried out at the speed of a straight punch and was carried out by a specialist in medical laboratory analysis, then it was transferred to elite laboratories to be processed and to extract the variables required to study it, according to what is explained in the details of the test for each of the variables investigated.

Main experience

High-intensity training was prepared in the HIIT style through exercises similar to the fighting environment in terms of the intensity used and the exercise periods, that is, the training volumes, while manipulating relatively small rest periods between repetitions for the purpose of accustoming the boxer to withstanding the accumulation of lactic in the blood and withstanding the speed of throwing punches, as the exercises continued for ten weeks and in reality Three training units per week, meaning thirty training units, which included high-

intensity training, ranging between 80-95% of the maximum intensity for each boxer, taking into account the individuality of training for young boxers.

Posttests

The researcher conducted the post-tests for the research sample members on Tuesday, September 19, 2023, taking into account the same conditions under which the pre-tests were applied.

Results and discussion

- *Presentation and analysis of the differences between the pre- and post-tests of the experimental group*

Table 2. Shows the values of the pre- and post-tests for the experimental group on the investigated variables

Variables	Pretest		Posttest		Calculated (t) value	Sig*	Indication
	Mean	Sd	Mean	Sd			
Anoxic capacity	34.78	1.91	40.88	1.99	5.44	0.006	Sig.
Endurance the speed of a straight punch	128.80	4.14	152.60	3.50	10.02	0.001	Sig.
LDH enzyme	259.08	7.20	279.41	9.06	2.88	0.4	Sig.
CAT enzyme	447.52	16.16	565.50	28.57	10.2	0.001	Sig.

* At a significance level of (0.05) and a degree of freedom of 4.

After presenting the results of the pre- and post-tests for the experimental group, the results showed significant differences for all of the research variables. This shows that HIIT training has greatly affected the anoxic capacity and straight punch speed endurance, as well as the enzymes for the lactic anaerobic energy system, as the high-intensity exercises that are similar to the nature of skill performance create Real adaptations for boxers. Adaptation is the reactions of the body's internal systems to meet physical requirements, and these responses are directly proportional to the intensity of the stimulus.⁵

- *Presenting and analyzing the differences between the pre- and post-tests of the control group*

Table 3. Shows the differences between the pre- and post-tests of the investigated variables

Variables	Pretest		Posttest		Calculated (t) value	Sig*	Indication
	Mean	Sd	Mean	Sd			
Anoxic capacity	35.46	1.33	37.60	2.42	3.05	0.03	Sig.
Endurance the speed of a straight punch	126.60	3.91	136.20	3.70	6.68	0.01	Sig.

LDH enzyme	256.40	8.94	265.65	7.75	2.04	0.1	Sig.
CAT enzyme	452.28	9.73	476.26	18.50	3.10	0.03	Sig.

* At a significance level of (0.05) and a degree of freedom of 4.

The results of the tests conducted on the control group showed that there was a difference between the pre- and post-tests regarding the research variables, and this shows that the trainer’s training during the experimental period had a good effect on the variables of vital capacity and straight punch speed endurance, as well as the LDH-CAT enzyme.

- *Presenting, analyzing and discussing the results of the differences between the post-tests of the experimental and control groups*

Table 4. Shows the differences between the post-tests of the variables investigated for the two research groups

Variables	Pretest		Posttest		Calculated (t) value	Sig*	Indication
	Mean	Sd	Mean	Sd			
Anoxic capacity	40.88	0.99	37.6	2.42	2.79	0.02	Sig.
Endurance the speed of a straight punch	152.60	3.50	136.20	3.70	7.19	0.00	Sig.
LDH enzyme	279.41	9.67	265.65	7.75	2.48	0.03	Sig.
CAT enzyme	565.50	28.57	476.26	18.50	5.86	0.01	Sig.

* At a significance level of (0.05) and a degree of freedom of 8.

Table (4) shows that the value of the significance level (sig) for the investigated variables is less than (0.05). This means that high-intensity training (HIIT) has significantly affected anoxic capacity, as studies indicate that high-intensity training, which is similar to the nature of performance, creates adaptations. Functional for developing performance and special energy systems, such as anaerobic capacity, which increases the speed endurance of the boxer, as well as punch endurance. This is the result of the development in the respiratory circulatory system, which was reflected positively in the development of anoxic capacity.⁶ The anaerobic endurance of muscle fibers depends on their ability to consume Oxygen, and this depends on increasing the muscle fiber content of myoglobin, anaerobic energy enzymes, and increasing blood capillaries.⁷ These functional changes are responsible for increasing the efficiency of the muscle in consuming and producing energy, and this helps the muscle withstand fatigue, especially withstanding the speed of punches. The nature of performing exercises regularly and at maximum speed through performing A combination of successive punches at high speed and within the lactic energy system leads to an increase in the development of muscle endurance, as speed of punches is required in fights by delivering quick punches to every part of the body.⁸ The high level of the lactate dehydrogenase (LDH)

enzyme after exertion in the special endurance test is due to the essential and vital role it plays in the biochemical reactions of the anaerobic galvanization system, which is the system that players rely on in performing physical efforts related to special endurance... as well as the GOT enzyme, as studies have proven. Increased activity of this enzyme in response to the stress of anaerobic training.⁹

Also, the increase in the level of lactate dehydrogenase (LDH) after exertion in the special endurance test is due to the fundamental and vital role it plays in the biochemical reactions of the anaerobic digestion system, which is the system that players rely on in performing physical efforts related to special endurance,¹⁰ that continuing to perform a metered physical load of high intensity for a period of (60 seconds) leads to a significant increase in LDH in the blood immediately after the performance. This is in addition to the fact that LDH stimulates the reactions related to converting Pronate into lactate,¹¹ which is consistent with the findings, that LDH works to catalyze the reactions involved in converting Pronate into lactate.¹²

Conclusions

1. HIIT training has clearly affected the variables of anoxic capacity as well as the speed endurance of the straight punch of young boxers.
2. High-intensity training (HIIT) contributed to raising the level of the LDH-CAT enzyme for members of the experimental research sample.

Recommendations

- The necessity of using high-intensity exercises in boxing training for all age groups, taking into account the training conditions, because of their great importance in creating great adaptations for boxers.

References

1. Abu Al-Ala Ahmed Abdel Fattah; Developing and measuring the maximum oxygen consumption for middle- and long-distance running runners, Cairo, Regional Development Center, Athletics Bulletin, No. 24, 1999.
2. Muayyad Abdul Ali Al-Tai. Foundations of mathematical physiology. Iraq: University of Babylon. 2013.
3. Abdel Rahman Abdel Azim: Physiological fitness of boxers, Alexandria, Dar Al-Wafa, 2010.
4. Fufh A., Youc, Kong, Z., Acute change in selected serum enzymes and metabolite concentrations in 12 to 14 years old athletes an all-out 100m, spring percept , Motor and skills , vol.95, no(3) Decemer, 2002.
5. Atweel, A., elal, the effect of multiple anaerobic exercise periods on level of lactate, lactate dehydrogenase, creatine Kinase , and aspartate transaminase, Australian Journal of science and Medicine in sport, vol.23, no, 1991.

6. Robergs,R, and Roberts,S,.Fundamental Principles of Exercise physiology for fitness, performance and Health,Mc Graw-Hill Publishers,Boston.2000.
7. Athab, N. A. (2019). An analytical study of cervical spine pain according to the mechanical indicators of the administrative work staff. *Indian J. Public Health*, 10(5), 1349.
8. Athab, N. A., Hussein, W. R., & Ali, A. A. M. (2019). A Comparative Study for Movement of Sword Fencing Stabbed According to the Technical Programming in the Game of Fencing Wheelchairs Class B. *Indian Journal of Public Health*, 10(5), 1345.
9. Athab, N. A., & Alsayigh, H. A. (2021). Rehabilitation of the wrist joint injury accordance of kinesiology variables.
10. Wilke, J., & Mohr, L. (2020). Chronic effects of high-intensity functional training on motor function: A systematic review with multilevel meta-analysis. *Scientific Reports*, 10(1), 21680.
11. Ardavani, A., Aziz, H., Phillips, B. E., Doleman, B., Ramzan, I., Mozaffar, B., ... & Idris, I. (2021). Indicators of response to exercise training: a systematic review and meta-analysis. *BMJ open*, 11(7), e044676.
12. Turri-Silva, N., Vale-Lira, A., Verboven, K., Quaglioti Durigan, J. L., Hansen, D., & Cipriano Jr, G. (2021). High-intensity interval training versus progressive high-intensity circuit resistance training on endothelial function and cardiorespiratory fitness in heart failure: A preliminary randomized controlled trial. *PloS one*, 16(10), e0257607.