Research on Biochemical Characteristics and Functional Evaluation of Athletes' Pre-match Training Based on Environmental Regulations

Xudong Yang[1, a], Donghui Dai[1], and Zhenjun Li[1]

[1]Sports Department, Shenyang Jianzhu University, Shenyang 110168, China.

[a]guzhaozheng@yeah.net

Keywords: Boxer; Winter Training; Biochemical Characteristics; Functional Evaluation.

Abstract. The environment affects the training efficiency and physical function of athletes. To this end, this paper studies the biochemical characteristics and functions of athletes' pre-match training based on environmental regulations. Through the performance monitoring of boxers during winter training and before the competition, the thesis understands the changes in physiological and biochemical indicators, the changes in performance and the fitness of the athletes at different training stages, and helps coaches improve their scientific training and ensure the health of athletes. Athletes achieve excellent results to provide protection.

1. Introduction

Women's boxing is a combination of strength, speed, endurance, technique and tactics, and psychology. It uses a variety of technical action combinations to score points or knock down opponents to assess the outcome of the game. When women's boxing first became an Olympic event, all countries attached great importance to it and hoped that they would win the event in the Olympic games and win glory for the country. Due to emerging sports, immature performance will inevitably occur during the development process. For example, during boxing training, boxing coaches may train female athletes based on the experience and methods of training male athletes. Due to the difference in performance, the training effect may not reach the desired effect. Therefore, only by monitoring the athletes 'training and timely understanding the athletes' functional status and the adaptation to the sports training load, can the training be scientific, effective and sustainable. In the past boxing training process, coaches mostly trained with their perceptual knowledge and experience. It is inevitable that subjective and one-sided problems will exist due to the evaluation of athletes' functional status and training effects based on experience, because experience is more the ground is an intuitive feeling that cannot be quantified and it is difficult to achieve scientific training. Only according to the training goals, according to the physical function, quality and special ability indicators of the athletes, combined with physiological and biochemical indicators, comprehensive analysis can determine the athlete's adaptation to the exercise load, and timely find out that the athletes due to physical stress or fatigue during training or competition Various problems caused, so in order to improve athletes 'sports performance and ensure scientific training, it is necessary to combine athletes' training goals with physiological and biochemical monitoring as the support to perform systematic and comprehensive training monitoring for athletes.

2. Research Objects and Methods

2.1 Research Objects

Taking six members of the women's boxing team of our athletic sports school as the research object and focusing on standardized techniques, all kinds of boxing techniques can be standardized and improved. Technical movements must be smooth and free, so that boxing techniques can be standardized and accurate Strengthen general quality and special physical fitness.

2.2 Training Methods and Means

Basic techniques include punching while traveling, air strike with a password, air strike with a mirror, and air strike with a punch. The stability of the standard boxing method is achieved through the hand target, so that the punching can achieve the powerful and accurate technical specification

  DOI: 10.25236/iceesr.2020.024

of the target. The sandbag is used to improve the hitting strength, while taking into account aerobic and anaerobic running to strengthen physical fitness. Strengthen the ability of the second attack to make its technology perfect in actual combat and combat. Strengthen strength and special physical fitness to increase the amount of exercise. Make the players with a large amount of exercise to make a good reserve. Play in the actual confrontation. Through actual combat, teaching competitions, exchange competitions, etc., improve the actual combat ability. Accumulate experience and identify shortcomings to prepare for pre-match training. Hand target practice, conditional actual combat, and teaching competition. Through the analysis and practice of the shortcomings exposed in the teaching competition, find out your own shortcomings, and carry out targeted training to improve the actual combat ability.

2.3 Statistical Methods

SPSS 21.0 statistical software was used to statistically process the experimentally measured data, and the statistical results were descriptive. The results were expressed as standard ± mean difference. Paired T test was performed before and after the experiment. $P < 0.05$ was considered significant. Sexual differences are significant at $P < 0.01$.

3. Results and Analysis

3.1 Changes in Athletes' Body Composition

From the characteristics of boxing, it must be supported by muscle strength and explosive power, and the body fat is too high, then it must affect the speed of movement, thereby increasing the exercise burden and energy consumption, and also affecting the athlete's muscle strength and sensitivity. Sex, explosive power and tactical level.

Table 1. Changes in body composition of women boxers

	Before winter training	During winter training	Before the game
Weight (kg)	66.55±10.64	64.28±10.81**	62.78±11.38#
BMI (kg / m2)	23.21±1.67	22.40±2.16	21.85±2.09△#
Body fat rate (%)	22.98±2.88	21.7±4.59	20.83±3.94
Fat content (%)	14.48±3.42	14.26±4.98	13.33±4.63
Muscle content (%)	48.16±7.40	46.33±5.85*	45.81±6.46
Lean weight (%)	53.03±8.04	51.50±6.46	50.98±7.1

In the above table, the comparison of the test results of female boxers before winter training and during winter training shows that the overall weight, BMI, and muscle content have significant changes. Weight loss, BMI content, and muscle content decrease are less. Women's boxers had significant differences in weight and BMI before winter training and before the game, and their weight and BMI decreased. Comparing the data during winter training and before the competition, there was a significant difference in BMI and muscle content. BMI decreased and muscle content decreased less. Comparing the values of boxers during winter training and before the match, the overall change is not great. From the characteristics of boxing sports, if the offense needs strength and explosive power, it is necessary to train the athlete's muscles to increase the body muscle content. According to Gao Bingzhang [1], according to the factors that affect the improvement of athletic performance, it can be concluded that the proportion of lean body mass and muscle content in the body will affect athletic performance. Compared with high athletes, the training level is high, and the greater the lean body mass, the better, there is a positive correlation between them.

Women boxers have a lot of fat in their bodies, which can train them into muscles and increase their lean body mass. Adequate skeletal muscle is the basis of strength and a guarantee of good athletic performance. In the process of training, coaches often use muscle content and lean weight to respond to muscle conditions in the body. Once there is too much body fat in the body, it will

affect the speed of movement, increase the load on the body, and affect the athlete's Strength, agility, explosive power, and tactical level.

3.2 Changes in Indicators During Mobilization Response

The reaction time of a boxing event refers to a sensitive index of the athletes when they are attacking and defending quickly. The boxer reacts to the stimulus given by the opponent in actual combat or competition. To fast defines, you can turn passive into active. This indicator is not only affected by congenital factors, but also by athletes' attention, movement speed, nerve transmission speed, and predictive ability. For the ever-changing playing field, athletes must be able to see six ways, listen in all directions, and pay considerable attention to ensure effective technical action.

Table 2. List of reaction time of women boxers

	Before winter training	During winter training	Before the game
Liu **	0.382	0.321	0.348
Week *	0.36	0.337	0.311
Zheng **	0.341	0.358	0.335
Chen **	0.367	0.354	0.326
Jia **	0.395	0.383	0.395
Lee *	0.346	0.3	0.315

Prior to winter training, Liu **, a key athlete, had a high response time, and Chen ** and Jia ** also had a high response time. During the test, the key athlete Liu ** was not in a good state and had an impact on the values tested. Small and medium-level players will have more advantages in this test. Athletes with large values in response need to strengthen their sensitivity and coordination. Compared with winter training and before winter training, Zheng ** and Jia ** have a long reaction time, which may be caused by inattention, and also have a great relationship with the mood when they react. If you are in a bad mood, in some cases, the reaction time is likely to be prolonged. Compared with the pre-winter training period, the value of Liu **, a key athlete, is faster during the winter training. According to the first test, the training is focused on the sensitivity. The sensitivity of Jia ** needs to be improved. Small and medium-level players will have more advantages in this test. Athletes with large values in response need to strengthen their sensitivity and coordination. Relatively speaking, according to the response time of the athletes to develop a corresponding training plan, the rest must pay attention to rest, the nutritional supplements must be supplemented. This can ensure that the athletes can play the best level no matter whether training or competition.

3.3 Changes in Lung Function Indicators of Athletes

During exercise, breathing will change differently depending on the sport. In sports such as boxing, the breathing muscles are experiencing extreme energy consumption during training and competition. Respiratory muscles during exercise are a saving of energy use and an increase in respiratory muscle endurance. At rest, the oxygen consumption of breathing exercise is about the entire body 2%; during moderate-intensity exercise, the breathing rate will increase, so that the oxygen consumption will increase to 3-5% of the overall oxygen consumption. Without training, the oxygen consumption of the respiratory system will increase to the maximum intensity exercise. During exercise, respiratory muscles are prone to fatigue due to increased tidal volume and breathing rate. Respiratory muscle fatigue is a more common phenomenon.

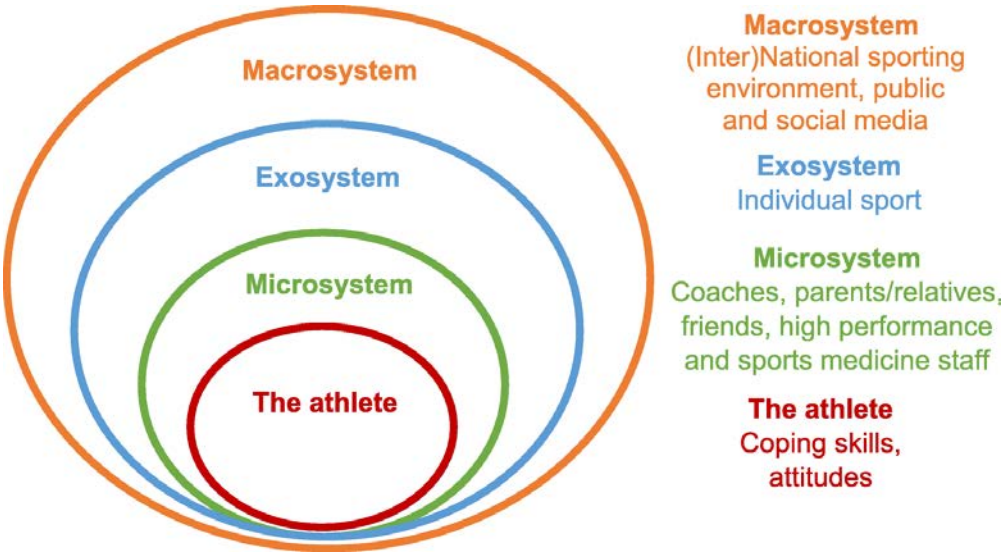

Figure 1. Changes in indicators when athletes respond.

3.4 Changes in Anaerobic Power of Athletes

In sports practice, anaerobic power is the main index for assessing anaerobic metabolism of athletes. Power (Power) is the work done by force in unit time, that is, the amount of work done in unit time. Some scholars have researched that the proportion of anaerobic energy supply for amateur boxing in competition is 60%. At the same time, during anaerobic metabolism, the blood lactic acid produced is not only an important indicator for assessing the energy supply of anaerobic metabolism. It is also in the physiology and biochemistry commonly used by boxers in the anaerobic power section. It is an indirect response to the athletes' anaerobic power in anaerobic power through laboratory experiments.

Table 3. Changes in anaerobic power of women's boxing for 15s

	Before winter training	During winter training	Sig.
Average work (W)	458.00±137.40	483.50±112.77	0.5
Maximum power (W)	560.67±132.17	553.50±136.12	0.85
Speed (rpm)	95.33±11.14	94.17±19.21	0.87
T peak (s)	8.36±3.23	8.01±2.08	0.86
Blood lactic acid for 3min (mmol / L)	7.45±1.49	6.66±1.41	0.41
Blood lactic acid 5min	6.22±1.23	6.59±1.21	0.43

As can be seen from Table 3, the anaerobic power of boxing women athletes before winter training and before the competition was not significant. Anaerobic work value is related to the body's muscle content and lean body mass content. The work and athletic ability of the body is closely related to the volume of the muscles. That is, the higher the muscle content and lean weight of the athlete's body, the greater the maximum work done, and the greater its explosive power and strength, which means that the stronger the athletic ability. The above data shows that the overall data is not significant, indicating that while the athletes lost weight, the anaerobic power remained stable. This may be due to the timely adjustment and rest of the athletes while their physical functions have declined, so as to stabilize the athlete's ability to supply energy during the training or competition of the body's phosphate system-glycolysis system.

3.5 30s Anaerobic Power Change

A large number of studies [2] believe that anaerobic power represents the ability of athletes to perform work in a short period of time, and the test of 30s maximum capacity continuous exercise

can clearly indicate the athlete's absolute strength, speed endurance and endurance strength level. The 30s anaerobic work mainly reflects the athlete's glycolytic metabolism ability. The larger the average power, the better, indicating that the athlete's speed endurance is strong. It indicates that the output power and the total power value are large. At the same time, the increase in blood lactic acid or the maximum blood lactic acid increases, indicating that the fatigue index is small, the glycolysis system is good, and the speed and speed endurance are reflected.

Table 4. Changes of anaerobic power of women's boxing in 30s

	Before winter training	During winter training	Sig.
Average work (W)	445.33±74.01	434.50±87.88	0.579
Maximum power (W)	538.50±99.23	523.00±104.34	0.437
Speed (rpm)	90.33±9.13	92.83±20.16	0.684
T peak (s)	10.38±3.99	10.10±2.52	0.888
Blood lactic acid 5min	9.19±1.09	10.42±1.31	0.128
Blood lactate 7min	8.38±1.40	10.08±1.22	0.088

3.6 Changes in Aerobic Metabolism of Athletes

The maximum oxygen uptake (VO_2max) refers to the amount of oxygen that the body can absorb when the body is unable to continue to support the next exercise during the maximum intensity exercise, and the amount of oxygen absorbed and used by the body per unit time [3]. Maximum oxygen uptake is an important indicator of cardiopulmonary function. According to different energy methods, exercise capacity can be divided into aerobic exercise and anaerobic exercise, including relative VO_2max (weight), VO_2max absolute work, heart rate, oxygen pulse, anaerobic threshold heart rate, AT- VO_2 relative value (weight), AT- VO_2 absolute value and other indicators. Maximum oxygen uptake is a manifestation of cardiac capacity reserve. Athletes with excellent performance have higher mental capacity and can bear greater physical load. Although the maximum oxygen uptake is more affected by genetic factors, after a long-term systemic endurance training, the cardiopulmonary function will also develop well and will show good cardiopulmonary function. During exercise, the more muscle groups or the number of participants in the exercise, the greater the maximum oxygen uptake, so when training, the coach will pay special attention to the amount of muscle training of the team members [4]. At the same time, the body's body fat rate is too much, a large amount of fat is accumulated, and weight gain will cause the body's oxygen consumption to increase. Therefore, lowering fat and performing aerobic exercise can improve the body's cardiopulmonary function and metabolism [5].

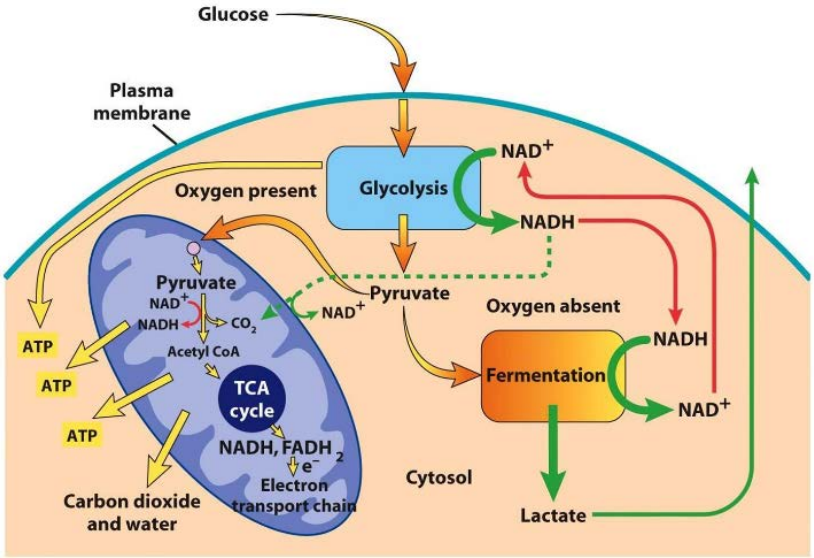

Figure 2. Everything in blood oxygen metabolism.

4. Conclusion

During the period of weight loss, the aerobic and anaerobic capacity of athletes did not decrease significantly, reflecting that athletes ’energy supply capacity was preserved to the greatest extent under the premise of weight loss. On the whole, there was no significant change in the biochemical indicators of the athletes, indicating that the athletes adapted well to the training load without causing excessive fatigue and injury. The key athletes timely discovered the low blood testosterone during the weight loss through biochemical monitoring. By supplementing nutrition and adjusting the training load, the athletes' status was adjusted in time to guarantee their excellent results.

References

[1]. Jia, J. Research on effects and compatibility taking of different sports supplements on the biochemical indicators and body functions of elite walking athletes., 9(1) (2015) 310-313.

[2]. Dongmei Wang, Jun Hu, Qiao Ma, Jiarui Ma, & Binjian Liu. Correlation between biochemical indicators of blood lipid with cerebral vascular diseases. International Journal of Clinical & Experimental Pathology, 8(3) (2015)3022-3026.

[3]. F. Ryszka, B. Dolińska, K. Czyż, M. Jelińska, & J. Bocheńska. Effect of recombinant human prolactin addition to biolasol solution on biochemical indicators in perfundates of porcine kidneys. Transplant Proc, 48(5) (2016)1824-1828.

[4]. Chaparrohuerta, V., Floressoto, M. E., Merin Sigala, M. E., Jc, B. D. L., Lemusvarela, M. L., & Torresmendoza, B. M., et al. Proinflammatory cytokines, enolase and s-100 as early biochemical indicators of hypoxic-ischemic encephalopathy following perinatal asphyxia in newborns., 58(1) (2017)70-76.

[5]. Lizwell Mapfumo, Voster Muchenje, John F. Mupangwa, & Michiel M. Scholtz. Changes in biochemical proxy indicators for nutritional stress resilience from boran and nguni cows reared in dry arid rangeland. Tropical Animal Health & Production, 49(7) (2017) 1-10.

[6]. Claret Mata, Carolina Pestana, Mary Lares, Antonietta Porco, & Jorge Castro. Relationship between antioxidant intake, nutritional factors and biochemical indicators in healthy volunteers. Archivos Latinoamericanos De Nutrición, 656(3) (2016) 201-210.