Fatigue and Recovery of Wushu Athletes Based on Fatigue Damage Model

Xue Yu
Department of Sports Education and Research, Northwestern University, ShaanXi, Xian 710069, china
xueyu8528@163.com

Abstract. The problem of sports injury and rehabilitation has always been a hot topic in competitive sports. With the continuous development of martial arts requirements and competition system, competitions are increasingly fierce and special technical requirements are more stringent. Exercise-induced fatigue can not only cause the decline of athletes' body ability, but also lead to the occurrence of sports diseases and sports injuries. Only by understanding the mechanism of fatigue, understanding the body's recovery process, recovery methods. Only in this way can we effectively improve our athletic performance and prolong our athletic life. The increase of training difficulty and intensity leads to the occurrence of sports injury more and more frequently, so the rehabilitation and recovery of athletes after injury is particularly important. According to the characteristics of sports fatigue of Wushu Athletes in sports training competition, this paper puts forward the means to eliminate the physical and psychological fatigue of Wushu athletes. In order to improve martial arts training, improve the competitive ability of athletes and improve the health of athletes to provide help.

1. Introduction
Martial arts is a kind of competitive sports mainly based on dynamic exercises. With the vigorous development of sports in recent years and the success of Beijing's 2008 Olympic bid, Wushu has gradually been recognized and valued by more and more people. With the continuous improvement of martial arts athletes' technical level, in order to further strengthen the training effect and achieve excellent results, martial arts athletes have been bearing a large load for a long time [1]. Sports fatigue, as a physiological and psychological phenomenon, has always accompanied the development of martial arts. Sports fatigue is an important factor that leads to the decline of athletes' functional ability, and it is also the main cause of athletes' injuries. It restricts the improvement of athletes' competitive ability [2]. On the basis of understanding the mechanism of martial arts athletes' sports fatigue, it has a positive effect to scientifically use physiological and biochemical indexes to evaluate the degree of sports fatigue in martial arts training, reasonably arrange sports training load and prevent overtraining and sports injury [3]. Sports fatigue can not only cause athletes' physical decline, but also cause sports diseases and sports injuries [4]. Affect the improvement of athletes' technical level and training effect, and end their training career prematurely.
A certain degree of fatigue in the athlete's body during martial arts training is the biological basis for improving the level of exercise, and it is the basic measure to excavate and improve the athlete's physical function and enhance the athlete's physical fitness [5]. Sports fatigue restricts the improvement of athletes' athletic ability. Martial arts is a power endurance project that needs to overcome its own weight. It has high requirements for athletes' strength, speed, dexterity, balance and stability. Martial arts training is a complex and scientific diversified project. Fatigue and recovery determine the success or failure of training [6]. Only by understanding the mechanism of fatigue, the recovery process and recovery method of the body can we effectively improve the performance and extend the life of the exercise. The improvement of athletes' performance level is caused by moderate exercise fatigue caused by training, and reasonable recovery is applied, so that the human body's functional status can obtain adaptive results at a new level [7]. The process of fatigue and recovery is an indispensable part of training, and reasonable functional recovery methods are an important guarantee for improving the level of training and physical function. Only by understanding the mechanism of fatigue, the recovery process and recovery methods of the body, and mastering the recovery methods of fatigue can we effectively improve the athletic performance and prolong the athlete's sports life. According to the characteristics of martial arts athletes producing sports fatigue in sports training competitions, this article proposes a method to eliminate physical and psychological fatigue of martial arts athletes.

2. The Mechanism of Wushu Athletes' Sports Fatigue
Exercise-induced fatigue refers to the temporary decline of human body's exercise ability due to physiological and biochemical changes during exercise. It is a physiological phenomenon occurring in the process of human body movement and a sign of human body functional activities. During training, a large number of exciting impulses are transmitted to corresponding nerve cells in cerebral cortex, and the long-term exciting impulses of nerve cells lead to increased energy and material consumption. When it is consumed to a certain extent, the corresponding nerve cells will produce protective inhibition, resulting in central nerve innervation imbalance. At the same time, due to large energy loss, lactic acid increases, while lactic acid increases and glycogen decreases will cause central fatigue. The unique form of martial arts makes a large number of exciting impulses transmitted to the corresponding nerve cells in the cerebral cortex. In order to avoid excessive energy consumption, when consumed to a certain extent, the corresponding nerve cells will produce protective inhibition. There is imbalance of central nerve control, decreased motor ability and fatigue. When martial arts athletes are training, lactic acid production lowers the pH value of muscles, inhibits the activity of phosphofructokinase, a key enzyme in sugar metabolism, and hinders the energy supply of glycolysis metabolism. At the same time, ammonia production in blood and tissues affects muscle working ability, and muscle spasm occurs when ammonia production increases in brain tissues. In martial arts training, excessive fat in the body is mobilized and free fatty acid in the blood rises greatly.

Functional exercise for injury prevention refers to the special protective exercise for the parts of the body that are prone to injury in order to prevent the sports injury in sports during the special training process. The system structure of martial arts special sports injury prevention method is shown in Figure 1.
The energy and materials consumed during training are gradually recovered after the exercise, and the recovery is good or even excessive. During the training, the internal environment and the balance of nervous, immune and endocrine systems were destroyed. During the recovery period, it should be recovered as soon as possible and as well as possible to improve the body's adjustment ability. For long fist training, it is mainly a high-intensity exercise with anaerobic glycolysis as the main energy supply, and the direct energy comes from ATP in skeletal muscle [8]. In the type of sugar supplement, glucose and fructose are suitable. Use as little sucrose as possible, fructose mainly increases glycogen storage in liver. Glucose mainly increases the content of myoglycogen. As an excellent martial arts coach, one should make timely and correct judgment on the physical condition of athletes according to various situations and information. According to the nature of the load to determine the intermittent time and mode.

3. Recovery of Wushu Athletes' Sports Fatigue

In the process of martial arts training, the application of biochemical indexes is an important means to scientifically formulate training plans, master appropriate intensity, evaluate training effects and diagnose functional fatigue. Individual's low or high achievement needs may be related to their different understanding of success and failure. During the training, the contents of the training can be changed in time and scientifically, the training load can be adjusted, and the movement parts can be changed to rest. This can accelerate the recovery of fatigue. One of the causes of exercise fatigue is the consumption of energy materials in the body. Its recovery method is to make reasonable nutrition arrangements according to the nutritional characteristics of different sports items. The main purpose of recovery is to eliminate fatigue, and its progress is related to athletes' physical condition and athletic ability. A regular living system can ensure the elimination of fatigue after exercise. Martial arts athletes each have their own characteristics, so in the training class, we should choose comprehensive training methods and methods suitable for individual characteristics. In the course of training, interval time should be arranged reasonably and training methods and contents should be changed frequently. Athletes should strictly abide by the prescribed work and rest system, pay attention to food hygiene, create good sleep conditions to improve sleep quality, and overcome bad habits such as smoking and drinking.

Martial arts athletes do not rest to relieve fatigue after they are tired. But to change the content of martial arts training in a timely and scientific manner, adjust the training load and change the movement parts as rest. In order to achieve the goal of eliminating fatigue. The traditional definition of time loss includes the classification of martial arts injuries and the changes of injury states. The change of damage state is shown in Figure 2.
Maximum strength and fast strength are important qualities that reflect muscle strength. The maximum force is the highest force value displayed when the will of the neuromuscular system is exerted to the greatest extent against resistance. Statistics are made on the test results of various mechanical indexes before and after training. The experimental results are shown in Figure 3.

From the perspective of martial arts training, basic skills account for a large proportion in the training. Every skill of athletes requires tens of millions of repetitions to finalize the design and establish a good proprioceptive feeling. There are a lot of running and jumping exercises in martial arts, so before, during and after the exercise, adding more carbohydrate and starch with high energy content is undoubtedly a promoting factor to improve martial arts athletes' sports ability. In order to speed up the recovery of athletes' sports fatigue, meat and protein should be added to the diet. Athletes should eat high protein and low fat food, and eat more food containing vitamin B1 and vitamin C. Martial arts training is an anaerobic exercise with sub-maximum intensity. The energy in the training process mainly comes from the aerobic metabolism or anaerobic metabolism of sugar, fat and protein [9]. Bathing therapy and hot compress can accelerate blood circulation and stimulate blood vessel expansion. Promote metabolism, accelerate the excretion of metabolites, is conducive to the absorption of nutrients in the body, at the same time is conducive to relax muscles, promote the recovery of fatigue. By allowing athletes to participate in beneficial social activities appropriately, they can meet the needs of the news media and the society. They can also deeply feel the satisfaction brought by hard training, so that athletes are full of hope for future training and have better psychological expectations.

4. Summary
With the development of modern competitive martial arts, the number of matches is becoming more and more frequent, and the difficulty and height of movements are constantly increasing and
improving. Wushu athletes have to bear more and more load in sports training, and the probability of sports fatigue is also higher. Sports fatigue in Wushu athletes' training includes muscle fatigue, nerve fatigue and psychological fatigue, which is determined by the characteristics of Wushu sports and training. This article reviews the mechanism, diagnosis and recovery measures of martial arts athletes' sports fatigue, so that coaches and athletes can understand the symptoms of fatigue at any time during training, and provide good help for improving the physical health of martial arts athletes and improving their competitive level. Martial arts athletes' sports fatigue and recovery are a unified whole. They influence and interact with each other and jointly promote the deepening and development of training. In the specific practical operation process, according to the specific physiological function and training intensity of martial arts athletes, several appropriate measures and means are selected to cooperate with each other, which can accelerate the elimination of fatigue and the recovery of physical strength, so as to ensure the healthy development of athletes' body and sports training and improve the sports ability of martial arts athletes as soon as possible.

References
[1] Ma Fei. Pros and Cons of Premature Specialized Training for Young Wushu Routine Athletes [J]. Wushu Research, 2019 (7): 55-57.
[2] Ji, MinJoon. Analysis of injury types for mixed martial arts athletes [J]. Journal of Physical Therapy Science, 2016, 28 (5):1544-1546.
[3] James L P, Haff G G, Kelly V G, et al. Towards a Determination of the Physiological Characteristics Distinguishing Successful Mixed Martial Arts Athletes: A Systematic Review of Combat Sport Literature [J]. Sports Medicine, 2016, 46 (10):1525-1551.
[4] Structural differences in basal ganglia of elite running versus martial arts athletes: a diffusion tensor imaging study [J]. Experimental Brain Research, 2015, 233 (7):2239-2248.
[5] Tavares F, Smith T B, Driller M. Fatigue and Recovery in Rugby: A Review [J]. Sports Medicine, 2017, 47 (8):1515-1530.
[6] Schiffer T, MLLinger A, Sperlich B, et al. Kinesio Taping and Jump Performance in Elite Female Track and Field Athletes and Jump Performance in Elite Female Track and Field Athletes [J]. Journal of Sport Rehabilitation, 2015, 24 (1):47-50.
[7] Mascarenhas V V, Rego P, Dantas P, et al. Imaging Prevalence of Femoroacetabular Impingement in Symptomatic patients, Athletes, and Asymptomatic Individuals: a Systematic Review [J]. European Journal of Radiology, 2016, 85 (1):73-95.
[8] Lenetsky S, Nates R J, Brughelli M, et al. Is effective mass in combat sports punching above its weight [J]. Human Movement Science, 2015, 40:89-97.
[9] Lystad R P, Graham P L, Poulos R G. Epidemiology of training injuries in amateur taekwondo athletes: a retrospective cohort study [J]. Biology of Sport, 2015, 32 (3):213-218.