Scholar Publishing Group
International Journal of Sports Technology
https://doi.org/10.38007/IJST.2022.030305
ISSN 2789-7141 Vol. 3, Issue 3: 66-80

The Rehabilitation Treatment of Muscle Strain in Athletes' Training

Haibo Zhao*

School of Physical Education College, Ningxia Normal University, Guyuan 756000, Ningxia, China

haibozhao0311@163.com

**corresponding author*

Keywords: Athlete Training, Muscle Strain, Rehabilitation Treatment, Rehabilitation Physical Training

Abstract: Muscle strain refers to a muscle's mechanical tension while it is relaxed. It refers to the period of muscle recuperation between contraction and diastole. Pain, impaired motor function, overload, and other effects can result from high stress. Lower tension, on the other hand, denotes weaker muscles and less motor function. The purpose of this essay is to look at muscular strain recovery during training.study on the rehabilitation treatment of muscle strain in training. This paper uses literature search, expert interviews, questionnaires, logical analysis, experiments and mathematical statistics. This paper firstly summarises the clinical rehabilitation effects of athletes' training injuries by investigating and analysing the training status of athletes' training in China, understanding muscle tension in athletes, through far mobilisation and coaching visits, and clinical examination by medical staff. In this paper, 100 athletes were studied for massage rehabilitation and physical training rehabilitation methods respectively, and the results showed that massage rehabilitation and rehabilitation physical methods significantly improved the effectiveness of rehabilitation treatment for athletes with muscle tension. Therefore, in order to enable athletes to return to their pre-injury state and level as soon as possible, massage rehabilitation and physical fitness are of great practical importance.

1. Introduction

At present, China has become the second largest economy in the world, and its comprehensive national strength has reached an unprecedented height. The prosperity and development of sports cause and the surge in the number of gold medals in the Olympic Games have confirmed China's

comprehensive strength. [1]. In the world sports power, colleges and universities are the production base of many excellent athletes. They can master professional theoretical knowledge while carrying out professional training. On the way of building China into a sports power, we can learn from the practice of selecting excellent athletes in foreign universities on the basis of our own national conditions. However, the road to becoming a sporting powerhouse involves hard work and endless sweat for the athletes. Many athletes often suffer from strains due to muscle strain during the training process. Therefore, this paper studies the rehabilitation treatment of muscle strain in athletes' training, which is of great significance.

Zhou Yijun, a Chinese scholar, believes that the development of sports cannot be separated from education. Competitive sports need the support of higher education. The combination of teaching and sports is a new mode of training sports talents in China [2]. As early as the 1980s, in order to improve the level of competitive sports in China, the sports department and the education department, on the basis of mutual consultation, successively issued a series of relevant policies to run high-level competitive sports in Colleges and universities. After the introduction of the policy, 52 colleges and universities in China have been experimented to recruit high-level athletes. The state requires the school not only to ensure the normal extracurricular activities of students, but also to carry out specialized training to ensure the competitive sports level of all high-level athletes. On the other hand, two years after the implementation of the policy, combined with the development of colleges and universities, the state has put forward a new goal for high-level sports teams. In Colleges and universities, an amateur training network system should be formed. One third of colleges and universities should have the ability to research sports researchers, complete sports facilities and other aspects, and the technical level of high-level athletes should be able to reach the national level Family level athletes [3]. Through continuous practice, it has been proved that the number of high-level sports teams in Colleges and universities established with the approval of the national competent department is increasing year by year, and the teams are growing, so that a steady stream of sports talents come out of colleges and universities, and go to the peak of their professional sports skills. While developing their own abilities, the level of sports competition in Colleges and universities is also greatly improved, especially the training results Remarkable [4]. With the training experience of developed countries such as Europe and America being used for reference by our country, the training level of our country has been greatly improved, but the traditional and conservative training concept also needs to be updated. The rising level of sports training and unscientific training methods lead to the increasing trend of sports injury year by year. Even if the athletes' sports level is higher, once they are injured, they may face the situation that the sports can no longer be continued or even serious and even bid farewell to the competition [5].

The main causes of muscle injury include inadequate training routine preparation, internal and external environmental factors, lack of medical knowledge and ideological weakening. In view of the above conclusion, it is proposed to improve safety awareness, attach importance to preparatory activities and relaxation exercises, optimize the strength training program of athletes, strengthen the combination of core strength training and special strength training, use physiological indicators to monitor and master sports rules, strengthen psychological training, improve external environment interference, strengthen medical supervision level, improve self-protection awareness, and promote muscle injury rehabilitation [6].

Because of the complex situation, independence and collectivity in the training field, and the uncertain factors of opposition, the athletes' body index needs comprehensive technical requirements, and the formation of these special techniques and tactics needs the athletes to achieve continuous high-intensity training in a long period of time, frequency and time. Because of the limitation of traditional indexes, daily training and technical training are still lack of special physical competitive sports training, and the concept of damage is lack of basic knowledge

education, through high-intensity centralized training will inevitably lead to the wear of athletes symmetrical muscle strength, cartilage and ligament function changes, which occur in different degrees of damage [7]. For athletes of any level, the emergence of injury and pain will affect the maturity of their sports skills and psychological balance in the process of sports, and even lead to the development of sports shadow. More talented athletes even end their careers ahead of time. How to evaluate, train, prevent and predict the risk of sports injury scientifically and effectively from massage and rehabilitation physical training to the current stage, design effective scientific and feasible rehabilitation physical training and apply it to daily training, and solve the problem of injury from the origin of muscle strain and training. It not only effectively ensures the physical performance ability of athletes, but also greatly improves the effect of coaches in the training process, which is a problem that all rehabilitation teachers and coaches need to solve [8].

As the muscle strain of athletes is an objective phenomenon, no matter what kind of competitive events, only in accordance with the scientific rules of gradual training, can improve the level of sports and performance; on the contrary, do not follow the scientific rules of the growth of sports skills and the scientific rules of physical and mental development of athletes, easy to lead to the occurrence of injury [9]. For athletes, the occurrence of sports injury is inevitable, but it is necessary to understand the relevant knowledge of injury, carry out effective rehabilitation training after injury, and try to reduce or avoid the adverse effects of injury on Athletes' training and competition level. There are many researches on sports injuries in various competitive sports. Many scholars have made in-depth analysis on the causes of sports injuries [10]. At the same time, there are endless rehabilitation methods for sports injuries. Combined with foreign advanced rehabilitation training methods, good results and major breakthroughs have been achieved. However, throughout these studies, there are few researches on the combination of sports injury rehabilitation and traditional Chinese medicine, lacking-of theoretical research, which indirectly affects the rehabilitation effect of sports injury. In this study, massage, acupoints, compression, compression, relaxation of muscles and bones were used. Different methods are applied to rehabilitation treatment. With the help of science, tests are carried out to verify the impact of rehabilitation. Further adjustment is made according to different injury types and injury degrees to improve the recovery of sports injury rehabilitation effect. Rehabilitation work provides certain reference for the future [11].

The practice of competitive sports tells us that the special training of any competitive event in sports training is to better excavate and improve the competitive ability of special athletes. The competitive ability of athletes mainly includes physical ability, skill, intelligence and psychological ability. The rapid development of the world sprinting level depends on the progress of sports science and technology, especially the innovation and development of modern scientific physical training methods. Strength quality is an important part of physical fitness. Strength ability is the power foundation of all human life activities and target behaviors, and also the primary carrier for people to achieve the goals of leisure fitness and high-level competitive sports. Many sports involve in a variety of basic comprehensive sports abilities such as human strength, speed, endurance, flexibility, sensitivity and coordination, while different sports put forward many personalized special requirements for special training. Therefore, today's strength training of athletes at all levels reflects a high degree of harmony and unity of comprehensiveness and specialization [12]. Scientific and systematic strength training is the cornerstone of the development of competitive sports. Therefore, in the modern training of athletes, coaches should attach great importance to the strength training of athletes, especially the strength training of muscle groups with high frequency of sports injury.

2. Methods and Measures

2.1. Research Method

Take 100 selected athletes as the research object. Through the investigation of sports injury and rehabilitation of athletes, according to the results of the investigation, the recovery effect of massage was evaluated.

(1) Literature method. Through the literature retrieval system of the library of Zhongbei University, this paper has consulted the books about sports injury, sports injury rehabilitation and other aspects, and has understood the characteristics of competitive sports, the basic knowledge of common sports injury and rehabilitation treatment methods; Through China cnki and WanFang database, the paper, journal and academic report on sports injury and rehabilitation of Wushu athletes are searched, and the above literature is analyzed and researched. The research results and current situation at this stage are understood, and some theories and knowledge are summarized for reference, which provides a reference for the development of this research.

(2) Questionnaire survey. The questionnaire was designed to help the qualitative analysis of the causes, nature, diagnosis, treatment and rehabilitation of athletes' injuries. The setting of the questionnaire was relatively simple, and it was not used for quantitative statistics. Therefore, the reliability and validity of the questionnaire were not tested. The main contents of the questionnaire include the basic personal information, the position, nature, time and injury factors of lower extremity injury. At the same time, the history, time, position, nature and injury factors of sports injury since the competitive training are also known to the athletes. At the same time, the relevant injured athletes should be carefully the examined and the detailed examination should be recorded. For the cases that are difficult to be confirmed, they should be determined after consultation with the relevant medical experts.

According to the statistics of the evaluation results of the validity test conducted by experts, 80% thought it was very suitable, and 20% thought it was more suitable. Therefore, the various questions contained in the questionnaire can basically reflect the content of the investigation and research and have validity. See Table 1 for details.

Table 1. Results of questionnaire validity evaluation

Validity	Very suitable	More appropriate	Commonly	Inappropriate
Frequency	7	3	1	0
Percentage	70%	30%	10%	0%

*The reliability of the questionnaire was evaluated by the method of retest. The correlation coefficients were 0.83 and 0.89, which proved that the research questionnaire had high reliability.

(3) Mathematical statistics. When verifying the reliability of the lower extremity function evaluation scale, use spss19.0 to verify the Cronbach α coefficient of the function evaluation scale; use Microsoft Excel 2016 to carry out statistical analysis on the data of epidemic disease investigation of competitive athletes, so as to provide basis for the writing of the article, in order to give full play to the data value and mine the value behind the data.

(4) Expert interview. 15 experts and scholars who have been engaged in sports teaching and training, physical development and rehabilitation training for a long time were interviewed on the characteristics of professional sports events, sports injuries, prevention and treatment of common injuries, rehabilitation training of key parts after injuries, so as to provide first-hand information for the design of functional evaluation scheme and the solution of injury rehabilitation problems. See

Table 2 for details.

Table 2. List of interview experts

	Name of experts		
1	Li*	Medical Research Institute	Professional coach
2	Wang**	General Administration of sport	Others
3	Yu**	Medical Research Institute	Attending doctor
4	Lou*	Chinese Football Association	Attending doctor
5	Jiang**	General Administration of sport	Professional coach
6	Yang*	Chinese Basketball Association	Others
7	Jia**	Chinese Athletics Association	Attending doctor
8	Li**	Chinese Badminton Association	Professional coach

(5) Experimental method. In the pre competition training period, 100 players were randomly divided into groups according to the test scores, and there was no significant difference in the initial information between the groups. The intervention group was given rehabilitation intervention training for 8 weeks, while the control group was given normal traditional routine training and retested after 8 weeks. The results of the tests before and after were statistically analyzed.

(6) Logical analysis. Based on the overall special characteristics of competitive athletes, the relationship between FMS test results and injury occurrence, as well as the selection of training actions, the paper analyzes the test results before and after the intervention, summarizes the basketball special characteristics and injury occurrence, and rehabilitation training options.

2.2. Rehabilitation Training

In this study, the leading rehabilitation training functional movement test methods at home and abroad, such as core strength, single foot jump, muscle strength, single leg squat, Y-type test, balance ability test and other simple test indicators, combined with the commonly used EMG test, three-dimensional movement analysis, foot pressure and other functional evaluation test methods in the laboratory, are applied to the rehabilitation training of athletes' lower limb injury, with a view to using scientific hands Segment method was used to test the effect of rehabilitation training. According to the measured data, it is necessary to arrange timely and effective rehabilitation training plan and improve the existing rehabilitation training plan for athletes with lower extremity injuries. This is a supplement to the theory of evaluation of athletes' lower extremity sports injury function and rehabilitation strategy, exploring practical methods for rehabilitation treatment of this type of injuries, so as to provide theoretical basis for the application of injured athletes in rehabilitation training According to.

Referring to the literature research of domestic rehabilitation physical fitness trainers such as Chen fangcan, Wang Weixing, Zhang Yingbo, etc., for example, based on the demand of basketball project, arrange the targeted rehabilitation physical fitness training plan, solve and strengthen the problems existing in the low injury risk group and the high injury risk group, as well as the chronic injury. After 20-30 minutes of training, 3-4 movements were selected for specific problems, 8-12 times in each group, 2-3 groups and 90-120s interval in each group. The training should be adjusted according to the actual situation of the athletes themselves.

2.3. Manual Massage

The main subjects of this experiment are 100 athletes with common sports injuries. Combined

with the athletes' sports injury records and recovery process, as well as the analysis of medical records, diagnosis certificates, X-ray films, etc., the scientific inspection method is used to detect the recovery effect of athletes after one week of manual massage in the recovery process after injury. In order to compare the recovery effect of manual massage on sports injury rehabilitation, according to the division of injury degree of athletes by the medical department of sports management center, 20 athletes who only received rehabilitation treatment but did not join manual massage were set as the control group, and 20 athletes who joined manual massage in rehabilitation treatment for one week were set as the intervention group.

3. Operation

In addition to muscle contusion caused by direct external force, muscle injury is mainly caused by indirect external force. Common strains of the posterior thigh muscles, lumbodorsal muscles, thigh adductors and so on. After muscle injury, pain, swelling, tenderness or spasm in the injured area will cause hard touch. When the injured muscles do active contraction or passive stretching, the pain increases. In case of muscle micro injury or a small amount of muscle fiber fracture, cold compress should be applied immediately, pressure bandage and improve the injured limb. In order to help complete treatment, it is generally recommended to apply Chinese medicine externally 24 hours later, or to choose the pain point for drug injection, physical therapy or massage. When most of the muscle fibers are broken or the muscles are completely broken, the wounded should be sent to the hospital for surgical suture as soon as possible after emergency treatment such as pressure bandaging.

3.1. Rehabilitation Training Content

The injury degree of knee joint and stepping joint of the 50 selected athletes is medium or below, that is to say, although the knee joint of the athletes has symptoms such as swelling and pain, it does not affect the normal training. The experimental group received 10-15 minutes of rehabilitation training before each training, while the control group did not receive rehabilitation training.

Clinical research shows that the injury of knee joint will lead to the weakness of muscle strength around the joint, and the phenomenon of quadriceps atrophy is common in the injured athletes. At the same time, it is accompanied by the retrieval of extension strength of knee joint, which will last for a long time during the injury of knee joint. The stability of the knee joint is affected and restricted by the muscle strength around the knee joint. The weakening of the muscle strength around the knee joint accompanied by the knee joint injury is the root cause of the lack of stability of the knee joint. It can well explain the low number of athletes passing the hurdle test and single knee kneeling test in the FMS test (many athletes can not complete the above tests).

Muscle strength training methods can be used for knee joint injury, mainly including unarmed rehabilitation training and training methods with simple equipment such as Swiss ball and elastic band. Unarmed rehabilitation training mainly relies on wall static squatting, while rehabilitation training methods with simple equipment include Swiss Ball squatting against wall, Swiss Ball squatting against wall single leg, elastic band squatting, elastic band squatting single leg, and Swiss ball back Hook leg [13].

In the muscle strength training of yikundo athletes' stepping joints, the strength training of the posterior calf muscle group (soleus muscle and fat intestine muscle) is the most important part [14]. However, the muscle strength training of athletes' stepping joint is not limited to this muscle group, because the movement of stepping joint is participated by many muscles, so we should also increase the strength training of tibial anterior muscle and the muscle to control entropion and valgus. The

resistance movement of stepping joint can be carried out with bare hands or with various equipment (such as dumbbells, elastic belts, etc.) to achieve the enhancement of calf muscle strength [15]. It can also be used to train more muscle contraction modes, such as isometric, isotonic, centripetal, centrifugal, etc. This kind of integrated and coordinated rehabilitation training mode of stepping joint muscle strength plays an obvious role in compensating the symptoms of stepping joint instability caused by ankle sprain.

3.2. Massage Content

Manual massage, as a physical therapy, can inhibit or excite the nervous system by stimulating the afferent nerve fibers of muscles and muscle keys. The regulation mechanism of nervous system can change the physical function of athletes, so as to reduce muscle ache, relieve fatigue and improve the rehabilitation effect of sports injury. At the same time, massage can enlarge the open area of capillary bed and increase the cross-sectional area of capillary. It can effectively prevent muscle atrophy, lack of joint activity, adhesion of ligament and tendon caused by sports injury, and can also promote the growth, development and healing of bone.

There are two kinds of muscle injury: direct external force and indirect external force. After muscle injury, there will be muscle stiffness, pain, pain, swelling and spasm. When the injured muscle contracts and stretches again, the pain will be aggravated. The function of manual massage is to relieve muscle spasm and rigidity, relieve pain, and avoid secondary injury and aggravation of pain.

(1) Press and knead press and knead the big thenar of the palm to damage the muscle, with light force, for 3-5 minutes.

(2) Push and pull use the thumb pulp to push inward on both sides of the pulled muscle first and then pull 8-10 times.

(3) Lifting and kneading: use the thumb pulp and the other four fingers pulp to grasp and knead the four fingers at the injured muscle position in the opposite direction of the thumb, and at the same time, the thumb is plucked left and right, but the force is small, and the four fingers are pressed and kneaded for 2-3 minutes.

(4) Point and pull use the thumb pulp to flick around the damaged muscle for 5-10 times, from heavy to light, with slight shaking after dialing.

The intervention group athletes were massaged after training and treatment. One week later, the physiological indexes and Omega wave body function test indexes of the control group and the experimental group athletes were collected respectively, and the data of the two groups were compared and analyzed.

(5) Under the same experimental conditions, the venous blood of the experimental group and the control group were taken at 7 a.m. after one week of manipulation, and Omega wave was used to test the body function. Test indexes: serum reatinase, blood urea nitrogen, hemoglobin, serum cuiketone, leukocyte, influencing factors of vagus nerve regulatory system, influencing factors of sympathetic nerve regulatory system, nerve tension index, influencing factors of non-periodic factors, influencing factors of standard deviation of respiratory wave.

(6) Omega Wave body function tester was used to detect vagal nerve, sympathetic nerve and nervous tension index; Nissan, hitachi-7020 automatic biochemical analyzer to detect serum creatinase, blood urea nitrogen, hemoglobin, white blood cells; access 2 automatic particle chemiluminescence immunoassay system to detect serum testosterone.

4. Results and Discussions

4.1. Investigation of Athletes' Muscle Strain

(1) It is very common for athletes to suffer from sports muscle strain. In general, the longer the training period, the higher the incidence of sports muscle strain. In order to prove the probability of athletes suffering from sports muscle strain in training or competition, this study mainly uses traditional strength training methods and functional strength training methods to investigate and analyze the situation of sports injury in the conventional environment.

Table 3. Investigation of athletes' muscle strain

Training method	Number of people with sports injuries	Percentage	No sports injuries	Percentage
Traditional strength training (68)	45	76.3%	17	23.2%
Number of trainers combined with functional strength (42)	12	17.2%	54	85.7%
Total (100)	57	48.6%	71	56.4%

According to the survey, 48.6% of the 100 athletes in the survey had different degrees of sports muscle injury, and 56.4% of the respondents had no sports muscle injury. Among them, the injury rate of athletes receiving traditional strength training is 76.3%, and that of athletes receiving functional strength training is 17.2% (see Table 3 and figure 1). It can be seen that the injury rate of traditional strength training is higher than that of functional strength training. Although some athletes are only slightly strained or sprained, which does not affect the later training or competition, it is enough to show that the injury probability of the athletes is still very high, nearly half of them have already passed, which is worthy of attention. If the preventive measures are sufficient, some sports injuries can be completely avoided.

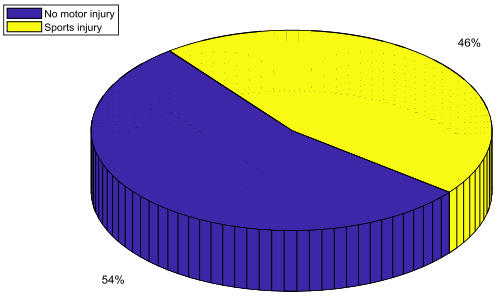

Figure 1. Overall situation of sports injury

There are various types of sports muscle injury, which can be classified into mild injury, moderate injury and severe injury according to different standards, acute injury and chronic injury according to the speed of sports injury; According to the position of the injured tissue structure, it can be divided into soft tissue injury, bone tissue injury and internal organs injury. If the skin of the injured part is complete, it is closed injury. If it is incomplete, it is open injury. According to sports technology, it can be divided into sports technology injury and non-sports technology injury.

(2) The most common reaction of muscle pull injury is inflammatory reaction. Edema is more than hemorrhage. Severe muscle tear produces hemorrhage. Sometimes there is subcutaneous hemorrhage. CT examination shows that the main reaction is edema and inflammatory space or into subcutaneous. Clinical examination showed that muscle pull often occurred in the distal hemorrhage of muscle, which often entered the fascia from muscle. The proportion of muscle fiber fracture near the muscle tendon junction was 17.9% - 30.2%. It can be seen from the research that muscle strain in different age groups will not only affect the results of training and competition, but also affect the recovery of injured muscle function. What's more, it can lead to disability or injury.

Muscle injuries are mainly caused by the original motor muscle and the weak link. The common parts of the injuries are the posterior thigh muscles, the back of the waist muscles, the adductor of the thigh and so on. According to the investigation and analysis, it can be concluded that the most common muscle injury of athletes is pulling the muscles behind the thigh, accounting for 65% of the total number of people investigated (see Table 4).

Table 4. Location of muscle injury (n = 100)

Position	Number	Percentage
Injury of posterior thigh muscles	65	65%
Musculus lumbago	19	19%
Adductor of thigh	8	8%

4.2. Rehabilitation Methods of Physical Training

The traditional strength training method is mainly passive recovery method, while the combination of functional strength training is mainly active recovery method. The rehabilitation of common clinical injury is mainly passive rehabilitation and competitive sports injury rehabilitation. Generally speaking, the recovery speed of muscle strain is related to the degree of injury, and the nature of muscle ache and muscle (or ligament) injury is totally different after exercise. Muscle soreness can be relieved by rest, traction, massage and so on [16]. The muscle (or ligament) injury must be solved by medical means. Choosing appropriate means to recover, the means of recovery can be roughly divided into active recovery means and passive recovery means. Compared with the passive recovery method, the complete recovery rate of the active recovery method is higher than that of the passive recovery method. The recovery of traditional strength training is weaker than that of functional strength training, in which the proportion of complete recovery of athletes' injury is only 76.4%, the proportion of incomplete recovery is 23.6%, while the proportion of complete recovery combined with functional strength training is 87.7%, which is far higher than that of traditional strength training methods. (see Figure 2 for details) "the biggest difference between sports injury rehabilitation and clinical rehabilitation is that clinical rehabilitation only needs to recover the injured part to the normal physiological level, while sports injury rehabilitation not only requires the injured part to recover to the normal physiological level, but also to recover to the competitive sports level before the injury. Through the rehabilitation training to further improve the body strength of the injured parts, for athletes can play to avoid the occurrence of re injury, and for

non-athlete patients can also play to avoid re injury. "

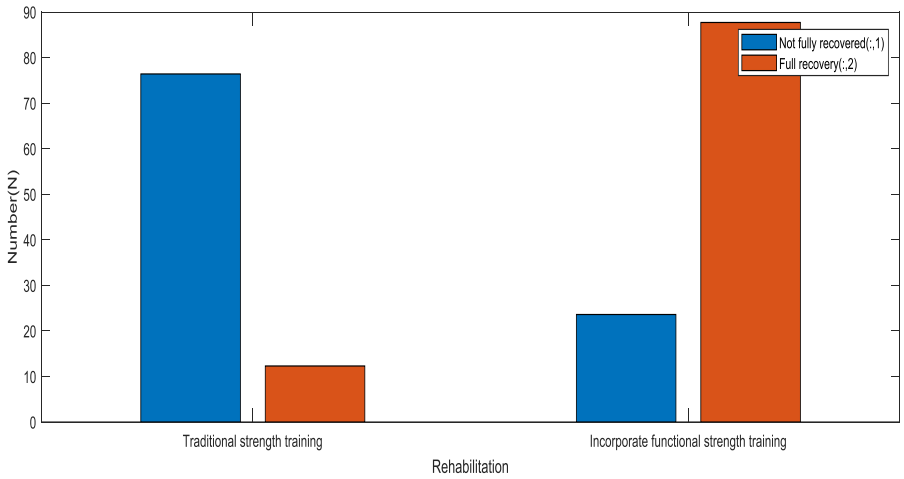

Figure 2. Investigation and comparison of rehabilitation by different restorative means

4.3. Means of Manual Massage Rehabilitation

(1) The value of serum creatine enzyme can reflect the change of cell enzyme in skeletal muscle. The value of serum creatine kinase is closely related to the injury of muscle. After rehabilitation treatment, the recovery of athletes can be seen from the decrease of the value of creatine kinase.

Table 5. Changes of serum creatine enzyme after manual rehabilitation (n = 20)

Date	Control group	Intervention group	P<0.05
17.10.31	6.33±1.23	4.32±0.23	yes
18.01.20	6.12±1.32	4.78±0.34	yes
18.02.13	6.19±1.08	4.17±0.56	yes
18.02.21	7.14±1.79	4.25±0.67	yes
18.03.02	7.28±1.25	5.36±0.89	yes
18.03.16	6.65±1.43	5.26±0,53	yes
18.05.04	5.98±1.07	4.67±0.22	yes
18.08.20	5.56±1.67	4.54±0.36	no

*It can be seen from table 5 that there is a significant difference in the serum creatine enzyme value of athletes after the rehabilitation treatment of sports injury added with manual massage (P < 0.05).

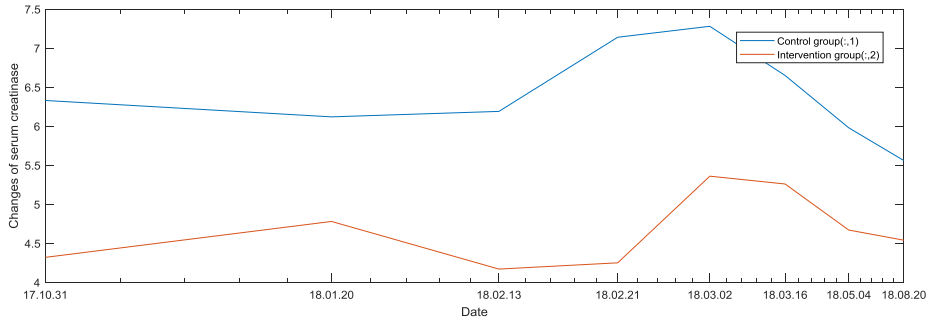

Figure 3. Detailed changes of serum creatine enzyme after manual rehabilitation

It can be seen from table 5 and figure 3 that when the p value after the two manual rehabilitation is greater than 0.05, the CK value before the rehabilitation is significantly higher than before. Although it is decreased after the manual rehabilitation, the large amount of training and the intensity of exercise make the fatigue of athletes not effectively relieved. Serum creatine enzyme reflects the changes of enzyme in skeletal muscle cells, which is greatly influenced by the amount of training and the intensity of exercise. CK value reflects the change of athletes' function, which has certain limitations. Generally, CK value can only reflect the stimulation degree of the body caused by the training amount and intensity in the past 2-3 days, which is greatly influenced by the training arrangement [17].

(2) In the investigation of athletes, it was found that with the increase of training amount and intensity, the value of blood urea nitrogen also increased, which was in direct proportion to the amount of blood urea nitrogen and exercise load. However, there is no significant difference in blood urea nitrogen, which indicates that the rehabilitation treatment with the addition of manipulations can improve the physical function of athletes, and the role of nitrogen protection is strengthened in protein catabolism. Moreover, with the increase of training amount and training intensity, the blood urea nitrogen did not increase significantly, which shows that the addition of manual massage in the rehabilitation treatment of sports injury enables athletes to quickly adapt to the training intensity and training amount, has a good effect on the adaptation and recovery of sports load, and has a positive effect on improving the sports training level and competition performance. See Figure 4 for details.

Table 6. Changes of hemoglobin after manual rehabilitation (n = 20)

Date	Control group	Intervention group	P<0.05
17.10.31	123 ± 7	142 ± 8	yes
18.01.20	134 ± 8	146 ± 7	yes
18.02.13	132 ± 9	145 ± 6	yes
18.02.21	126 ± 8	153 ± 9	yes
18.03.02	137 ± 6	147 ± 11	yes
18.03.16	124 ± 7	148 ± 10	yes
18.05.04	133 ± 8	151 ± 8	yes
18.08.20	125 ± 9	144 ± 12	yes

*It can be seen from table 8 that there is a significant difference in hemoglobin value of athletes after manual massage in rehabilitation treatment of sports injury ($P < 0.05$). Hemoglobin is the main medium of oxygen delivery in human body. Relatively high hemoglobin content helps athletes to transport more oxygen to all parts of the body. Too high or too low will affect athletes' Sports Ability [18].

(3) Omega wave athletes' functional state assessment is to timely feed-back the physiological function of athletes by testing and analyzing the changes of ECG and EEG of athletes. Its main test indicators included: influence factors of vagus nerve regulation system, sympathetic nerve regulation system, tension index, non-periodic factors, standard deviation of respiratory wave, etc. Vagus nerve is the longest and most widely distributed pair of brain nerves. Vagus nerve has motor, sensory and parasympathetic nerve fibers, which control the secretion of most organs and heart in respiratory and digestive systems and can reduce the contraction and heart rate; Sympathetic nerve is an important part of the autonomic nervous system. In the state of normal body function, sympathetic nerve and parasympathetic nerve are in the balance state of mutual inhibition because of their opposite functions. However, when the body is in a tense activity, sympathetic nerve activity plays a major role, which can make the heart beat faster, skin and visceral blood vessels

contract, pupil dilation, etc.

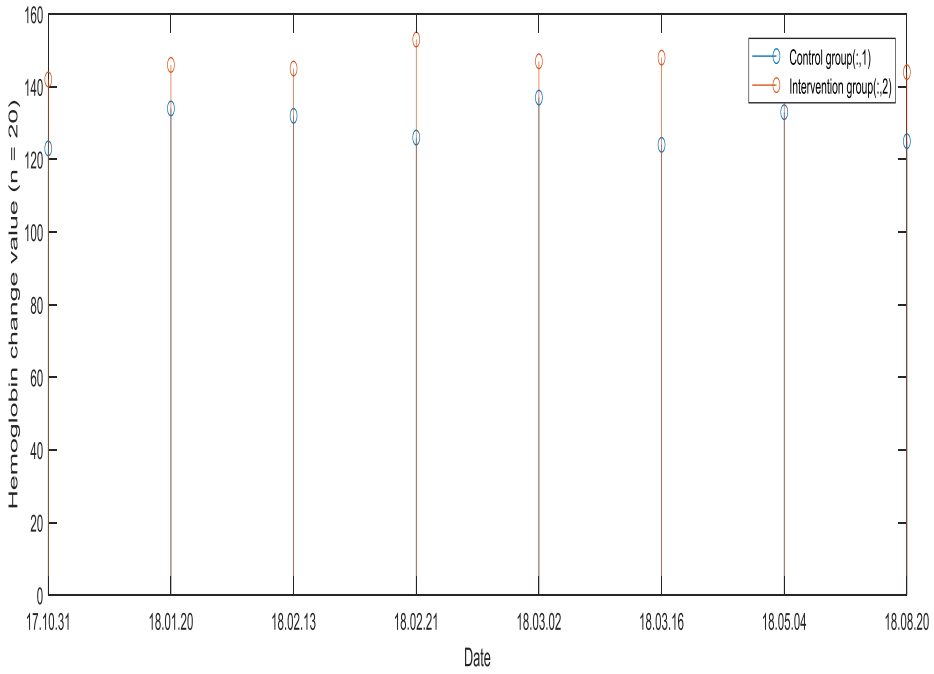

Figure 4. Detailed changes of hemoglobin after manual rehabilitation

Table 7. Influence Factors of vagus nerve regulation system after manual rehabilitation (n = 20)

Date	Control group	Intervention group	P<0.05	Normal value range
17.10.31	0.33±0.03	0.32±0.03	yes	0.16-0.41
18.01.20	0.12±0.02	0.78±0.04	yes	0.16-0.41
18.02.13	0.19±0.08	0.17±0.06	yes	0.16-0.41
18.02.21	0.14±0.09	0.25±0.07	yes	0.16-0.41
18.03.02	0.18±0.05	0.36±0.09	yes	0.16-0.41
18.03.16	0.35±0.03	0.26±0,03	yes	0.16-0.41
18.05.04	0，18±0.07	0.27±0.02	yes	0.16-0.41
18.08.20	0.16±0.67	0.54±0.06	no	0.16-0.41

*It can be seen from table 11 that in the test of the influence factors of Omega wave on the vagus nerve regulation system of athletes after manual rehabilitation, there is a significant difference in the influence factors of vagus nerve regulation system ($P < 0.05$). Manual massage can effectively reduce or improve the imbalance of vagus nerve regulation mechanism caused by injury or a lot of training, promote the influence factors of vagus nerve regulation system to maintain within the normal value, improve the physical fatigue status of athletes, the level of central nervous fatigue and improve the recovery ability of athletes.

5. Conclusion

It can be concluded from the above chart that Omega is used The comparative analysis of wave instrument's test results on the physical function indexes of athletes shows that manual rehabilitation has a good recovery effect on the vagus nerve regulation system and sympathetic

nerve regulation system of athletes, can effectively relieve the heart fatigue and central nerve fatigue caused by the disorder of vagus nerve regulation system and sympathetic nerve regulation system, and greatly relieve the physical fatigue of athletes Fatigue and resilience are reduced. Through the analysis of the physiological and biochemical indexes of athletes, it can be seen that manual rehabilitation can significantly alleviate the serum creatinase, hemoglobin and effectively avoid the low immunity caused by sports injury or fatigue. It significantly improves the effect of rehabilitation treatment of sports injury and enables athletes to recover to the state and level before injury faster and better after the occurrence of sports injury. After summarizing and analyzing the reason, mechanism, location, type, training characteristic, degree and type of sports injury. Combined with the effect of massage rehabilitation, it is found that manual rehabilitation can reduce or avoid the causes of sports injury, such as sports injury caused by fatigue; It also has good rehabilitation effect on some types and parts of sports injuries of athletes, such as manual massage, which can relieve the chronic injuries of joints, knee joints, wrist joints and stepping joints.

Although the athletes in the control group did not have targeted rehabilitation training, they took some medical interventions. In addition to medical interventions, the athletes in the intervention group also increased targeted rehabilitation training of knee joint and stepping joint. These rehabilitation training methods can gradually restore the normal range of motion of the injured joint, improve the strength quality of the muscles around the injured joint, fully mobilize the proprioception of the neuromuscular by improving the coordination ability of the neuromuscular, restore the proprioception function to the maximum extent, and promote the recovery of the motor function of the injured part by improving the above aspects Promote the improvement of overall body function. Similarly, there is no significant difference between the YBT results of the experimental group and the control group before the experiment, but the difference between the test results after the experiment is quite obvious in all aspects, which shows that rehabilitation training is helpful to improve the athletes' lower limb sports ability, and its effect is very obvious.

On this basis, the research results are applied to practice. We should continue to strengthen the supplement and learning of rehabilitation and sports training knowledge, expand the research content and improve the level of intervention objects. Specifically: in the subsequent daily training, the program can be used continuously, and adjusted according to the level of the players, personalized intervention for different athletes and more detailed and accurate training. Strengthen the study of human body knowledge and the application of different screening methods, such as anatomy, biomechanics, psychological functional structure, etc. The results of statistical data will be kept on file, and the sample size will be accumulated continuously in the subsequent research to form the FMS database and provide reference for others.

Funding

This article is not supported by any foundation.

Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

References

[1] Jugoslav, V., Nebojsa, M., Dragan, K., et al. (2015) Predicting the Future of Sports Organizations. Motriz Revista De Educação Física, 21(2):107-115. DOI:10.1590/S1980-65742015000200001

[2] Haijing, H. (2015) Competitive Advantage, What Does It Really Mean in The Context of Public Higher Education Institutions. International Journal of Educational Management, 29(1):44-61.

[3] MA De-hao, JI Liu. (2015) Sports Participation by People of Low Strata in China: Current Situation,Restriction Factors and Promotion Strategies. Journal of Physical Education, 6(3):311. DOI:10.1016/j.jcin.2012.08.027

[4] Bryan, D., Terry, L., Scott, S., etal. (2017) The Functional Movement Screen as a Predictor of Injury in National Collegiate Athletic Association Division II Athletes. Journal of Athletic Training, 53(1):29-34. DOI:10.4085/1062-6050-528-15

[5] Green, B. D., Lin, M., Mcclelland, J. A., et al. (2020) Return to Play and Recurrence After Calf Muscle Strain Injuries in Elite Australian Football Players. The American Journal of Sports Medicine, 48(13):3306-3315. DOI:10.1177/0363546520959327

[6] Ranchordas, M.K., Rogerson, Soltani, et al. (2018) Antioxidants for Preventing and Reducing Muscle Soreness after Exercise (Review). British Journal of Sports Medicine. DOI:10.1136/bjsports-2018-099599

[7] Mahmood, S., Alon, E., Daria, S., et al. (2017) The Effect of Two Different Interval-Training Programmes on Physiological and Performance Indices. European Journal of Sport Science, 17(4):1-8. DOI:10.1080/17461391.2017.1321687

[8] Hassan, K. A. (2020) Effect of Stretching Exercises in Treatment of Muscle Strain: A Systematic Review. Fizjoterapia Polska,20(5):96-104.

[9] Xiang, Y., Arefeen, A. (2019) Computational Methods for Skeletal Muscle Strain Injury: A Review. Critical Reviews™ in Biomedical Engineering, 47(4):277-294. DOI:10.1615/CritRevBiomedEng.2019029194

[10] YiWei, H., ChaoJung, W., RouhMei, H., et al. (2015) Interplay among Membrane-Bound Lytic Transglycosylase D1, the Crebc Two-Component Regulatory System, the Ampng-Ampdi-Nagz-Ampr Regulatory Circuit, and L1/L2 β-Lactamase Expression in Stenotrophomonas Maltophilia. Antimicrobial Agents & Chemotherapy, 59(11):6866-72.

[11] Gande, A., Hemachandran, K., Juan R, J.,(2021) Indian Premier League Using Different Aspects of Machine Learning Algorithms, Journal of Cognitive Human-Computer Interaction, Vol. 1, No. 1: 01-07. https://doi.org/10.54216/JCHCI.010101

[12] Elhoseny, M., Ramírez-González, G., Abu-Elnasr, O. M., Shawkat, S. A., Arunkumar, N., & Farouk, A. (2018). Secure Medical Data Transmission Model for Iot-Based Healthcare Systems. Ieee Access, 6, 20596-20608. DOI:10.1109/ACCESS.2018.2817615

[13] Jabbar, A. E. , Nagham, J. (2021) Novel Filter of DWT for Image Processing Applications, Fusion: Practice and Applications, Vol. 4 , No. 2 , 32-41 https://doi.org/10.54216/FPA.040205

[14] Ngan, T. R., Florentin, S. (2021) H-Max Single-Valued Neutrosophic Distance Measure in Medical Diagnosis, International Journal of Neutrosophic Science, Vol. 15 , No. 2 , 62-76 . https://doi.org/10.54216/IJNS.150201

[15]Mohammed, I., Alghamdi. (2022) Neutrosophic Set with Adaptive Neuro-Fuzzy Inference System for Liver Tumor Segmentation and Classification Model, International Journal of Neutrosophic Science, Vol. 18 , No. 2 ,174-185. https://doi.org/10.54216/IJNS.180202

[16] Kim, T., Kim, S., Ko, Hoon. (2021) Design and Implementation of BCI-based Intelligent Upper Limb Rehabilitation Robot System. Acm Transactions on Internet Technology,21(3). DOI:10.1145/3392115

[17] Carlos, A., Tavera, Jesús H. Ortiz, Osamah I. Khalaf , Diego F. Saavedra,and Theyazn H. H. Aldhyani"Wearable Wireless Body Area Networks for Medical Applications",Computational and Mathematical Methods in Medicine ,Volume 2021, 9 pages. DOI:10.1155/2021/5574376

[18] Sudhakar Sengan,Ganga Rama Koteswara Rao,Osamah Ibrahim Khalaf and M. Rajesh Babu. (2021). Markov mathematical analysis for comprehensive real-time data-driven in healthcare Vol 12 No 1 : Mathematics in Engineering, Science and Aerospace (MESA).