MUSCLE INJURIES AND RECOVERY TRAINING IN COLLEGE SPRINTERS

LESÕES MUSCULARES E TREINAMENTO DE RECUPERAÇÃO EM VELOCISTAS UNIVERSITÁRIOS

LESIONES MUSCULARES Y ENTRENAMIENTO DE RECUPERACIÓN EN VELOCISTAS UNIVERSITARIOS

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ABSTRACT

Introduction: The sprint is extremely explosive, and inadequate training methods can cause irreversible muscle damage. Objective: Explore the types of sports injuries, the main sites, the main factors affecting the results of physical training, and the main factors affecting recovery from muscle injuries in college and university sprinters, and propose preventive measures. Methods: Taking 174 college sprinters as the research object, we analyzed the conditions related to muscle injury and physical training of sprinters, using field investigation, questionnaire survey, and mathematical statistics. The types of sports injuries, the main sites, the main factors affecting the results of physical training, and the main factors affecting college sprinters' recovery from muscle injury were investigated. Results: Among the 174 athletes surveyed, 47.7% had sports injuries of different degrees, and 52.3% had no sports injuries. Different physical training methods, training time, training levels, and slack fatigue training can affect physical training results. Conclusion: College sprinters should improve their safety awareness, give importance to preparatory activities and flexibility exercises, optimize strength training programs, and use physical and exercise therapy to promote recovery from muscle injuries. ***Level of evidence II; Therapeutic studies - investigation of treatment outcomes.***

Keywords: Sports Injuries; Physical Fitness; Fatigue; Physical Education and Training.

RESUMO

Introdução: O velocismo é um esporte extremamente explosivo, e métodos de treinamento inadequados podem causar danos musculares irreversíveis. Objetivo: Explorar os tipos de lesões esportivas, os principais locais, os principais fatores que afetam os resultados do treinamento físico e os principais fatores que afetam a recuperação das lesões musculares dos velocistas em faculdades e universidades, propondo medidas preventivas. Métodos: Tomando 174 velocistas universitários como objeto de pesquisa, analisou-se as condições relacionadas à lesão muscular e ao treinamento físico dos velocistas, utilizando investigação de campo, levantamento de questionários e estatísticas matemáticas. Pesquisou-se os tipos de lesão esportiva, os principais locais, os principais fatores que afetam os resultados do treinamento físico e os principais fatores que afetam a recuperação da lesão muscular dos velocistas universitários. Resultados: Entre os 174 atletas pesquisados, 47,7% apresentaram lesões esportivas de diferentes graus, e 52,3% não tiveram lesões esportivas. Diferentes métodos de treinamento físico, tempo de treinamento, níveis de treinamento e treinamento negligente de fadiga podem afetar os resultados do treinamento físico. Conclusão: Os velocistas universitários devem melhorar sua consciência de segurança, dar importância às atividades preparatórias e aos exercícios de flexibilização, otimizar o programa de treinamento de força, usar a fisioterapia e a terapia de exercícios para promover a recuperação de lesões musculares. ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

Descritores: *Lesões esportivas; Aptidão Física; Fadiga; Educação Física e Treinamento.*

RESUMEN

Introducción: El sprint es un deporte extremadamente explosivo, y métodos de entrenamiento inadecuados pueden causar daños musculares irreversibles. Objetivo: Explorar los tipos de lesiones deportivas, las principales localizaciones, los principales factores que afectan a los resultados del entrenamiento físico y los principales factores que afectan a la recuperación de las lesiones musculares en velocistas colegiales y universitarios, proponiendo medidas preventivas. Métodos: Tomando como objeto de investigación 174 velocistas universitarios, se analizaron las condiciones relacionadas con las lesiones musculares y el entrenamiento físico de los velocistas mediante investigación de campo, encuesta por cuestionario y estadística matemática. Se investigaron los tipos de lesiones deportivas, las principales localizaciones, los principales factores que afectan a los resultados del entrenamiento físico y los principales factores que afectan a la recuperación de las lesiones musculares de los velocistas universitarios. Resultados: De los 174 deportistas encuestados, el 47,7% tenía lesiones deportivas de distinto grado y el 52,3% no tenía lesiones deportivas. Los diferentes métodos de entrenamiento físico, el tiempo de entrenamiento, los niveles de entrenamiento y el entrenamiento descuidado por fatiga pueden afectar a los resultados del entrenamiento físico. Conclusión: Los velocistas universitarios deben mejorar su conciencia de seguridad, dar importancia a las actividades preparatorias y

a los ejercicios de flexibilidad, optimizar el programa de entrenamiento de fuerza, utilizar la fisioterapia y la terapia de ejercicio para promover la recuperación de las lesiones musculares. ***Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.***

Descriptores: *Lesiones deportivas; Aptitud Física; Fatiga; Educación y Entrenamiento Físico.*

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INTRODUCTION

At present, China has leapt to the second largest economy in the world, its comprehensive national strength has reached an unprecedented height, and the sports industry is booming.[1] Among the world sports powers, colleges and universities are the production bases of many excellent athletes. They can master professional theoretical knowledge while conducting professional training. On the road 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.[2] At the same time of developing the athletes' own ability, the sports competitive level of colleges and universities is also greatly improved, especially the training results.[3] At this stage, the establishment of high-level sports teams in colleges and universities has been widely concerned by the society. The competitions of different levels and types are also increasing, leading to increasingly fierce sports competitions. In order to achieve better sports results, the sports load that athletes bear is increasing, and the sports injuries caused are also increasing.[4] Unscientific training methods and high-intensity sports load, although there is a great probability of achieving good results in the short term, in the long run, it is not conducive to extending the athletes' sports career, and it is difficult for athletes to maintain their own high level for a long time. Research shows that once sports injuries occur, the systematic training of athletes will be broken, not only the physical health will be affected, but also the training effect will be reduced. Sports injuries seriously restrict the development of high-level sports teams in colleges and universities.[5,6]

With the increase of competitions at different levels and types, athletes will be overwhelmed under the increasingly fierce competition. The load from the psychological body will break the physical and mental defense lines of athletes, causing sports injuries of different degrees, The systematic training of athletes has been broken, so it is urgent to develop a set of targeted physical training system, and effectively reduce the probability of athletes' sports injury and muscle injury.[7] Exercise induced muscle injury refers to the damage to the skeleton and membrane of muscle cells caused by repeated high-intensity exercise, non habitual exercise, resistance exercise, long time exercise and eccentric exercise, which is an unavoidable part of sports training. In recent years, more and more literature's have reported the possible physiological mechanism, adaptive mechanism and intervention measures of sports induced muscle injury, which aims to reduce the negative impact of sports induced muscle injury on sports training practice.[8]

Relevant concepts and research

The study is Purely observational studies which no need to registry ID of ICMJE, and all the participants were reviewed and approved by Ethics Committee of Gannan Normal University, China (NO. 2022009)

A review of the causes of sprint injuries and muscle injuries

At the maximum speed stage of sprint, the main force distance controls the mode of lower limb movement, the external force load borne by lower limb muscles and the cause of injury, especially the role of muscle strength changes of the rear thigh muscles that are vulnerable to injury during the exercise. Through collecting the kinematics, dynamics and EMG data of the main muscle groups of the lower limbs of high-level sprinters at the fastest stage of sprint, the link interaction dynamics method is introduced to study the lower limb motion control mechanism and the force on the rear thigh muscle groups at the fastest stage of sprint, and analyze the main force distance controlling the lower limb motion and the neuromuscular conditions of the lower limbs at the fastest stage of sprint. The following conclusions are drawn: First, The muscle force distance and the external force distance generated by the ground reaction force control the main force distance of lower limb movement during the support period; Secondly, muscle torque and inertia moment generated by link movement are responsible for mainly controlling lower limb movement during swing period; Third, at the end of the support period and the swing period, the inertial force distance obviously participates in the movement; Fourth, the stress state of the posterior femoris muscle group shows a similar state at the initial stage of support and the end of swing, that is, the posterior femoris muscle group is simultaneously pulled in the opposite direction by the external force distance, so that it is placed in a huge stress strain. The posterior femoris muscle group has a high injury probability at the initial stage of support and the end of swing.

Prevention and rehabilitation of physical training methods for muscle injury

The conclusion of the study shows that if we only observe from the form of action, the special strength training methods of sprinters are not very different, but the differences in the subtleties of the action are obvious. It can be seen that it is very important to deeply analyze and understand the role of special strength training means in training practice. At the same time, it is difficult for any single type of training means to have a decisive impact on the overall improvement of sprinters' lower limb specific strength. Therefore, the diversified means of special strength training should be combined with special strength training in order to comprehensively improve the special strength of sprinters' lower limbs. Whether the specific strength training of lower limbs can improve the specific performance depends on whether the specific strength training of lower limbs of sprinters is consistent or similar with the specific skills of lower limbs of sprinters in terms of movement structure, muscle strength and kinematics. Only when the above consistency is reached can the specific strength level of lower limbs of sprinters be improved by using the means and methods of lower limb strength training in training practice, Strength training close to the essence of the specific event can achieve better training effect. The research on the causes of sports injury and muscle injury of sprinters mainly includes: First, the characteristics of sprinting determine the sports injury position of sprinters; Second, subjective factors such as nonstandard technical movements, insufficient preparatory activities, and excessive tension psychology lead to insufficient energy and muscle damage during sports; Third, the ground equipment, climate and other factors, resulting in sprinters sports injuries; Fourthly, gender is another inducement for sprinters to suffer sports injuries. The study found that male athletes have a higher incidence rate of sports injuries than female athletes. The domestic research on the prevention and rehabilitation of muscle

injury of sprinters is mainly carried out from the following aspects: First, the prevention and rehabilitation measures of sprinters' sports injury are studied from the perspective of physical fitness training methods; Secondly, from the perspective of sports injury prevention and sports training rehabilitation, the paper discusses the prevention and rehabilitation measures of muscle injury of sprinters; Third, research on sports injury prevention and rehabilitation from the perspective of interactive dynamics, physiology and rehabilitation medicine.

Teaching experiment design

This paper takes the sports injury and physical fitness optimization training of sprinters in a college sports meet as samples, finds out the current situation of injury types of high-level sprinters in colleges and universities, the location of injury, how to diagnose, how to prevent, and how to optimize physical fitness training, It is helpful to reduce the sports injuries of high-level sprinters in colleges and universities. Coaches should pay attention to the health level of athletes, and popularize the knowledge of scientific training and health training, Strengthen their awareness of safety training and comprehensively prevent college sprinters from sports injuries.

In this study, 44 coaches and 174 athletes from 20 colleges and universities were selected as the survey objects. Questionnaire survey method. According to the needs of this study, we designed questionnaires for coaches and athletes of high-level sports teams in colleges and universities.[9] Questionnaires were distributed to 44 coaches from 20 universities of all high-level sports teams and 174 sprinters from 20 universities of all high-level sports teams. The questionnaire recovery is shown in Table 1

Mathematical statistics. This paper mainly uses statistical software to analyze and process the results of the questionnaire given by the coaches and athletes of high-level sports teams in colleges and universities, and uses relevant statistical methods to explain the data.[10]

According to the statistics of the evaluation results of the validity test conducted by experts on the questionnaire, 80% thought it was very suitable and 20% thought it was quite suitable. Therefore, the various questions contained in the questionnaire can basically reflect the content of the investigation and research, with effectiveness. (See Table 2)

The reliability of the questionnaire was evaluated by the method of retest, and the correlation coefficients were measured twice before and after the questionnaire was issued. The correlation coefficients of the two times were 0.85 and 0.88 respectively, which proved that the research questionnaire had high reliability.

Experimental results and analysis

In this paper, a provincial college high-level sports team sprinter sports injury as the research object. Taking the coaches and athletes of the college students' games and colleges with high-level sports teams as the objects of investigation, the purpose is to find out the current situation of injury types of high-level sprinters in colleges and universities, the location of injury, how to diagnose, how to prevent and how to optimize physical training by investigating and analyzing the sports injury status of high-level sprinters in colleges and universities.

Table 1. Statistics of distribution and recovery of questionnaires.

Type	Issue questionnaires	Take back the questionnaire	rate of recovery	Valid questionnaire	Effective
student	174	174	100%	174	100%
coach	44	44	100%	44	100%

Table 2. Questionnaire validity evaluation results.

Validity	Very suitable	Quite appropriate	Commonly	Inappropriate
Frequency	8	2	0	0
Percentage	80%	20%	0%	0%

Investigation and Analysis of Athletes' Sports Injuries

Athletes suffering from sports injury is a very common situation. Generally, the longer the training years, the higher the incidence of sports injury. In order to prove the probability of sprinters suffering from sports injuries during sprint training or competition, this study mainly investigated and analyzed the situation of sprinters suffering from sports injuries by using traditional strength training methods and functional strength training methods under the conventional environment. According to the survey, 47.7% of the 174 athletes surveyed had sports injuries of different degrees, and 52.3% of the respondents had no sports injuries. The injury rate of athletes receiving traditional strength training was 78.4%, and that of athletes receiving functional strength training was 16.3%. It can be seen that the injury rate of traditional strength training is higher than that of functional strength training.

Investigation on the current situation of sports injury types of athletes

There are various types of sports injuries, which are classified differently according to different standards. Judging from the situation that athletes participate in training after sports injury, the degree of sports injury can be divided into three levels: mild injury, moderate injury and severe injury. Among them, minor injury refers to the injury that can be trained according to the original plan after injury; Moderate injury refers to an injury that cannot be trained according to normal conditions after injury, but needs to go through a recovery period; After severe injury, you cannot participate in training at all, and you must strictly follow the clinical injury treatment method, take the medicine and physical therapy in a still position, and need a long recovery treatment.

Analysis of Sports Injuries of Athletes

There are various ways of sports injury. In sprint training and competition, muscle strain is most likely to occur due to insufficient preparation or weather. This is because when the temperature of the internal or external environment of the body is low, the viscosity of the muscle will be too high, which will reduce the muscle elasticity during sports, causing muscle or ligament strain. In addition, sprint sports have strong sports load and explosive force, which is easy to cause ligament damage during routine training or competition. No matter muscle or ligament, there is a threshold in the bearing capacity. If it exceeds the threshold range for a long time, it will inevitably cause sports injury. The research found that the most common sports injuries mainly include joint injury, muscle injury, ligament injury, contusion, abrasion, bone fracture and fracture. Muscle injuries were the most, up to 31 people, accounting for 37% of the total; The number of joint injuries was 22, accounting for 27%; The number of ligament injuries was 13, accounting for 16% of the total; There were 8 cases of contusion, accounting for 10%; 5 people were abraded, accounting for 6%; There were 2 cases of bone fracture, accounting for 2% of the total injuries; 1 person time of fracture, accounting for 1% of the total injured person time; One person suffered from other injuries, accounting for 1%. (Figure 1)

Physical training is a long-term and complex process. The physical training methods often used in college sprint events are traditional strength training and functional strength training. The traditional strength training often only conducts strength training on a certain muscle or a certain muscle group, which is highly targeted. The method and means are single, focusing on the anatomical function of a single muscle or muscle group. The training results tend to be too large in local strength, resulting in uncoordinated active muscles and antagonistic muscles. The real role of muscles or muscle groups in special actions is ignored because they are divorced from special needs.

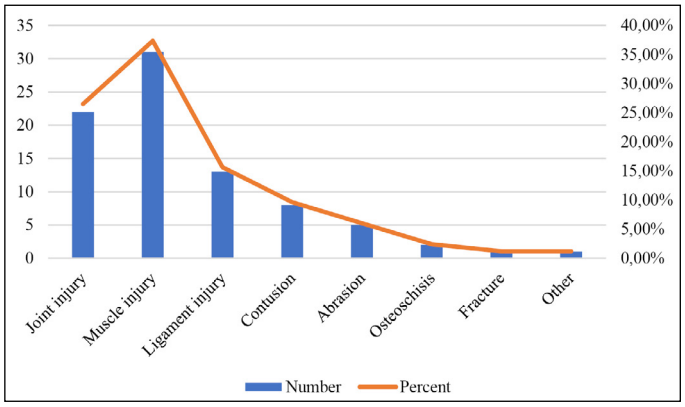

Figure 1. Questionnaire on Sports Injuries.

CONCLUSIONS

This paper takes the sports injury and physical fitness optimization training of sprinters in a college sports meet as samples, and through the investigation and analysis of the sports injury of high-level sprinters in colleges and universities, the current situation and characteristics of sports injury of college sprinters are as follows: First, 47.7% of the 174 athletes surveyed had sports injuries of different degrees, and 52.3% of the respondents had no sports injuries. The injury rate of athletes receiving traditional strength training was 78.4%, and that of athletes receiving functional strength training was 16.3%; Second, among the injured athletes, the highest proportion was mild injury, which exceeded more than half of the investigated athletes, up to 50, accounting for 60%; Moderate injury ranked second, with 27 people, accounting for 33%; The least severe injury occurred in 6 persons (7%); Third, the most common sports injuries mainly include joint injury, muscle injury, ligament injury, contusion, abrasion, bone fracture, fracture and other seven kinds of sports injuries; Fourth, muscle injuries often occur in the source muscles and fragile links. The most common areas of strain injuries in sprints are the posterior thigh muscles, the lumbar dorsal muscles and the adductor muscles of the thigh. Fifth, different physical training methods, training years, training levels and unscientific fatigue training affect the results of physical training. Sixthly, the means of injury prevention, muscle injury recovery, diagnostic criteria and different training methods are the main factors affecting muscle injury recovery.

All authors declare no potential conflict of interest related to this article

AUTHORS' CONTRIBUTIONS: The author made significant contributions to this manuscript. Junqing Chen: writing and performing surgeries; data analysis and performing surgeries; Liling Zhao: article review and intellectual concept of the article.

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