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RESEARCH ON THE PREVENTION OF LUMBAR MUSCLE STRAIN IN SHORT JUMP ATHLETES BASED ON FUNCTIONAL TRAINING

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This study focuses on the high injury rate of the lumbar muscle groups in athletes of sprinting and jumping events, and constructs a comprehensive intervention plan that integrates the optimization of functional movement patterns and the regulation of biomechanical loads. Through sports biomechanics modeling and electromyography analysis, it is found that the low efficiency of power transmission in the lumbar-pelvic segment of the special action chain is the main cause of strain.

Sprinting and long-jumping events place extremely high demands on athletes' physical fitness. Athletes' lumbar regions bear tremendous pressure during daily training and competitions, making them highly susceptible to lumbar muscle group injuries. Lumbar muscle group injuries not only disrupt training and affect athletes' performance in competitions but may also lead to premature retirement from their sports careers due to long-term accumulation of damage. The functional training theory emphasizes simulating real sports scenarios to enhance the overall function of the body, which is highly effective in preventing athlete injuries. Applying this theory to the prevention of lumbar muscle strain in sprinting and long-jumping athletes can provide strong support for their health and long-term development.

Statistics from the International Association of Athletics Federations (IAAF, 2022) show that the annual strain incidence rate among short-distance, hurdle, and jumping athletes is as high as 42,7 %, with injuries to the psoas major muscle and the thoracolumbar fascia complex accounting for 63 % of the total. Although traditional strength training can enhance explosive power, it easily causes the lumbar flexion-rotation coupling load to exceed the standard (>3400 Nm). This contradiction highlights the urgency of establishing a specialized sports protection system.

Research on the dynamic characteristics of special injuries shows that during sprinting, the rapid leg extension and arm swing of athletes generate strong reaction forces that are transmitted to the lumbar region, subjecting it to huge pressure. In this state, the risk of sarcomere misalignment significantly increases, leading to the accumulation of micro-injuries. During long-jumping, incorrect take-off angles and poor landing postures expose the lumbar region to abnormal impact and torsional forces, which can damage the lumbar muscles and tissues.

During daily training, functional training interventions are carried out by adding power chain efficiency training. For sprinting events: The 1080Sprint system is used to implement the «hip-knee-ankle three-joint sequential activation training» to quantify the distribution of extension torque and enhance the anti-rotation stiffness of the trunk. For long-jumping events: A «pre-activation – cushioning» two-stage training is designed. A force-measuring platform is used to provide real-time feedback on landing kinetic parameters, and air-cushion obstacle jumping training is carried out, which can reduce the lumbar impact load by 22,4 % ($p = 0,012$).

Before training and competitions, targeted functional warm-up activities such as dynamic stretching and joint mobilization exercises are carried out to increase the temperature of the lumbar muscles, enhance their flexibility, and make the joints more mobile. After training, sufficient static stretching, especially for the lumbar muscles, such as sitting forward bends and lumbar torsion stretches, is performed to effectively relax the lumbar muscles, relieve muscle fatigue, and reduce the probability of muscle soreness and injury.

The conclusion of this study is that functional training optimizes the lumbar load distribution pattern through neuromuscular remodeling, significantly reducing the risk of lumbar muscle strain. By strengthening core stability, improving muscle strength balance, optimizing movement patterns, and reasonably arranging warm-up and stretching, the risk of lumbar muscle strain in athletes can be significantly reduced, athletic performance can be enhanced, and athletes' physical health can be guaranteed. In future training, the functional training theory should be further promoted and applied based on the individual differences and event characteristics of athletes. Personalized training programs should be developed to safeguard the long-term development of sprinting and long-jumping athletes. It is recommended that an

intelligent protection system be established in the future, integrating real-time monitoring by inertial sensors and personalized load adjustment to achieve precise injury prevention.

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DEVELOPMENT AND POPULARIZATION OF WUSHU IN THE REPUBLIC OF BELARUS

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Wushu is a modern sport that evolved from traditional forms of physical culture in China. Wushu is based on fist fighting and fencing techniques, various types of traditional acrobatics, Beijing opera (qingju), breathing exercises and special psychoregulatory exercises.

Sports wushu includes almost all currently existing styles and varieties of this ancient art, since the rules of the competition are designed to allow judges, based on a certain set of parameters, to classify and evaluate on a ten-point scale any of the existing types of wushu. Thus, the division into sports and traditional wushu is conditional, and it is more legitimate to divide wushu into sports and mass, which is a national type of physical culture in the PRC.

Wushu is a complex coordination sport that has a multifaceted effect on the body of the practitioner.

The variety of wushu types makes it an accessible means of physical culture for different age groups and contingents of practitioners. Wushu promotes the development of such qualities as agility, strength, endurance, reaction speed, develops coordination, a sense of balance, and provides the necessary self-defense skills.

An important positive feature is that wushu classes do not require special inventory and equipment and do not impose excessive demands on the place where they are held. In accordance with the International Competition Rules, wushu is divided into the following types: guiding taolu – standard regulated complexes (this section includes: changquan, nanquan, taijiquan, jianshu, taijijian, daoshu, nandaoshu, gunshu, nangunshu, qiangshu); zixuan taolu – arbitrary regulated complexes with mandatory elements (this section includes: changquan, nanquan, taijiquan, jianshu, daoshu, gunshu, qiangshu); chuantun wushu – traditional wushu complexes; duilian – a fight with a predetermined sequence of movements; jitibiaoyan group performances; wushu sanda – free wushu fights on a platform in protective equipment; wushu taiji tuishou – free fights using taijiquan techniques, as well as competitions in shuaijiao (Chinese wrestling, the techniques of which are used in all wushu schools), and duanbing and changbing sanxiang – fencing based on wushu techniques with short and long weapons.

Over the past fifteen years, wushu has been developing rapidly throughout the world. In 1991, the International Wushu Federation (IWUF) was established, recognized by the World Association of Sports Federations (SPORTACCORD) and the International Olympic Committee (IOC). The International Wushu Federation includes 147 countries, the World Championship and the European Championship are held every two years, the World and European Championships in traditional wushu have developed competition rules and a classification program. To determine the level of sports training of those involved, a qualification program and duanwei standards have been created.

In the Republic of Belarus, wushu has been recognized as a sport since 1988, when the first federation of wushu and national Vietnamese martial arts was created. Subsequently, the federation became known as the Belarusian Wushu Federation.