Research and Analysis of Knee Joint Injury and Rehabilitation in Badminton Athletes Training

Juan Li

Xianyang Normal University, Shaanxi, Xianyang, 712000, China

544758356@qq.com

Keywords: Badminton, Injury of Knee Joint, Training

Abstract: With the popularization of national sports consciousness and the vigorous development of badminton, more and more people are taking part in badminton. With the continuous popularization and improvement of badminton, knee joint injury has also become a psychological obstacle that puzzles badminton lovers to develop their technical level. The ability of human body joints to bear load is limited. When an action exceeds the limit that the body can bear, the body will suffer various acute or chronic injuries. With the continuous popularization and improvement of badminton, knee joint injury has also become a psychological obstacle that puzzles badminton lovers to develop their technical level. In badminton, the knee joint injury of athletes' lower limbs not only affects the normal training of the trainers, but also affects the daily work and life of the trainers. In order to provide theoretical basis for badminton fans to prevent and treat sports injuries, this paper analyzes the causes, types and treatment methods of knee joint injuries in badminton.

1. Introduction

Badminton has now become a popular sport in our country and is deeply loved by the masses. With the continuous popularization and improvement of badminton, knee joint injury has also become a psychological obstacle to badminton lovers to play their technical level [1]. Badminton is one of the traditional sports in our country, which integrates athletics, fun, fitness and entertainment. It can enhance the functions of human circulation, respiration and other systems, and improve the body's speed, strength, endurance, flexibility, sensitivity, coordination and other qualities. From the perspective of athletic footwork, badminton players' lower limb movements on the court include sudden stop, quick rise, return movement, take-off and so on [2]. Most of them involve the basic movements of the lower limbs. Therefore, what kind of reasonable joint angle, speed and appropriate relative position of links to push the ground will be directly related to badminton performance. Badminton belongs to the skill-oriented type of net-separated competitive event group, which has the characteristics of intense antagonism, high intensity of sports and no time limit for competitions [3]. The ability of human body joints to bear load is limited. When an action exceeds the limit that the body can bear, the body will suffer various acute or chronic injuries [4]. If not handled properly, it will limit the fitness ability of the bodybuilder and have a huge impact on the work and life of the bodybuilder.

The sport of badminton is very popular among the general public. According to the survey, we can see that the people engaged in badminton exercise are ranked second in all sports, second only to those who participate in jogging, and the competitive level of the badminton is also It has been greatly improved [5]. Badminton players need to continuously make various complicated technical moves on the court. Although there is no direct physical confrontation by athletes, the complexity, suddenness and continuity of their movements are very strong. With the continuous popularization and improvement of badminton, knee injury has also become a psychological barrier that baffles badminton enthusiasts to play their technical level. Badminton is a sport with very high requirements on physical fitness and technology. Badminton players need to continuously make various complicated technical moves on the court. Although there is no direct physical confrontation by athletes, the complexity, suddenness and continuity of their movements are very

  DOI: 10.25236/medsbe.2020.034

strong [6]. From the perspective of athletic footwork, the lower limb movements of badminton players on the court include emergency stop, emergency start, return movement, and jump [7]. In badminton games and training, the change of the ball path has irregularities and the rapid transition between offense and defense. During this process, participants often start suddenly, change direction, etc. in an abnormal state [8]. This article starts with the biomechanical knowledge of the knee joint, the technical action of badminton, and the mechanism of injury, reveals the biomechanical conditions of knee joint injury in badminton, analyzes its principle, and provides a scientific fitness method for preventing knee injuries of badminton bodybuilders.

2. Special Characteristics and Damage Characteristics of Badminton

In badminton training and practice, the number of excessive exercises for a certain movement or the time of repeated exercises is too long, which is beyond the range that the body can bear. This will lead to chronic strain or acute injury of joints. Badminton is a high-intensity sports event integrating human speed, strength and flexibility. Speed quality is divided into reaction speed, action speed and displacement speed. The human body is structurally connected by many joints, so the human body can be simplified as a link chain when studying human body movement. When the end of the link chain produces great strength and speed, the movement form of the limb is usually shown as acceleration and braking from the proximal link to the distal link in turn, and the speed of each link is also shown as increasing from the proximal end to the distal end in turn. When the knee is straightened, the lower leg is rotated outward, the tibial tubercle moves outward about half the distance of the patella, and the patella slides on the pulley from inside to outside, so that the axis of the patella and the patellar tendon are in a straight line. The extension, flexion and rotation of the knee are well coordinated with the movement of the patella. Footwork occupies the core position in badminton technical movements, and it is also the starting movement of most technical movements of badminton. Flexible mastery of badminton footwork can enable badminton players to quickly change positions to move to the best position to finish hitting the ball and return to the preparation position or move to the next position to prepare opponents to return to the ball.

In badminton training and competition, participants often make repeated moves such as forward, backward, pedal, etc. within a short distance, and the knee joint bears a large load. The quality of footwork in the front court directly determines the competition results to a great extent. The frequency of footwork used by badminton team members in the competition was summarized. As shown in Table 1.

Table 1 Frequency of footwork used by players in the competition

Name of footwork	Male	Female
Step by step	1024	612
Step forward	497	314
Cross step	384	269

If the fast ball is played quickly, the physical strength will be greatly consumed. According to the characteristics of badminton, medial collateral ligament of knee joint is more easily injured, followed by sprain of anterior cruciate ligament of knee joint. Table 2 shows the characteristics of elbow angle changes in the two stages when the subject hits the drop ball and kills the ball.

Table 2 Variation characteristics of elbow joint angles in two stages during hanging and killing

Defeat type	First stage	Second stage
Drop shot	20.24±2.21	26.24±1.97
Smash	36.81±3.32	40.26±2.69

It takes a certain time for athletes to recover from knee injuries. If they are trained too early, acute injuries can turn into chronic injuries, so the timing of training should be grasped. The displacement speed of badminton players can be said to be the sum of the individual movement

speed and movement conversion speed. Badminton players need not only considerable muscle strength and very good fast strength, but also very good endurance. Judging from the form of muscle contraction, badminton players need not only good isometric contraction ability, but also good isometric and eccentric contraction ability. When the knee joint is a very complicated joint, it is a heavy large joint composed of the distal end of femur, proximal end of tibia and patella. The femur and tibia are connected and reinforced by cruciate ligament, the periphery of the joint is surrounded by joint capsule, and two collateral ligaments are on both sides of the joint capsule [9]. When the load exceeds the limit it can bear, it will cause acute or chronic injury to the knee joint. From the point of view of sports mechanics, for the foot flexion movement that rapidly pushes off the ground, the joint that finally occurs must be the metatarsophalangeal joint. In badminton, it also requires a kind of sensitive quality of improvisation, that is, it must be judged quickly and accurately with the changes of the situation on the court under the constantly changing external conditions, and complete all kinds of actions promptly and decisively.

3. Analysis of Knee Joint Injury Mechanism Based on the Characteristics of Badminton Events

3.1. Master the Correct Technical Actions

Badminton is a highly skilled sport. Incorrect technical movements cause knee joint injury training and technical movements in competitions to change quickly, change directions more and have more strain. If athletes do not protect themselves, they will be easily injured. Footwork occupies the core position in badminton technical movements, and it is also the starting movement of most technical movements of badminton. Flexible mastery of badminton footwork can enable badminton players to quickly change positions to move to the best position to finish hitting the ball and return to the preparation position or move to the next position to prepare opponents to return to the ball. Badminton movement consistency means that the technical movements before hitting the ball are basically consistent, but in different hitting techniques, the striking point, timing, striking surface and outgoing ball show slight differences in strength, speed and direction at the moment before hitting the ball. The consistency of actions is based on the integrity of actions. From the point of view of sports mechanics, for the foot flexion movement that rapidly pushes off the ground, the joint that finally occurs must be the metatarsophalangeal joint. Its flexion and extension features can have an important impact on the running and jumping movements of the human body, especially on the stare-off effect at the later stage of support. In order to increase the efficiency of badminton players' footwork, badminton shoes are constantly updated on the basis of defining the characteristics of badminton footwork, so as to achieve the effects of increasing wearing comfort, improving footwork movement performance and protecting feet, thus preventing injuries.

3.2. Creating a Good Sports Environment

The human body is structurally connected by many joints, so the human body can be simplified as a link chain when studying human body movement. When the end of the link chain produces great strength and speed, the movement form of the limb is usually shown as acceleration and braking from the proximal link to the distal link in turn, and the speed of each link is also shown as increasing from the proximal end to the distal end in turn. Lack of or insufficient preparation before exercise, poor physical condition, lack of training to adapt to the environment, and too long time in the exercise are the primary causes of knee exercise injuries [10]. Badminton movement consistency means that the technical movements before hitting the ball are basically consistent, but in different hitting techniques, the striking point, timing, striking surface and outgoing ball show slight differences in strength, speed and direction at the moment before hitting the ball. Acute sports injuries are more frequent than chronic sports injuries. The causes of improper treatment of acute injuries, untimely or early participation in training can be converted into chronic injuries, strain, re-injury or relaxation of tendon and ligament. [11] As long as the movements are complete, the differences between the movements will be reduced and the techniques of various technical

movements will be close to the same. In fact, the higher the level in the competition, the chance in attack is often created by the confrontation of balls in the middle section. If the fast ball is played quickly, the physical strength will be greatly consumed.

4. Conclusions

Knee joint injury is one of the common injuries in badminton. There are many researches at home and abroad, and the importance of knee joint injury is getting higher and higher. Incorrect badminton movement techniques, excessive sports and incorrect sports hygiene habits can all cause different degrees of injuries. In sports training, attention should be paid to the arrangement of content and load according to physical characteristics, training level and training period. Ideological education for athletes should also be strengthened to establish a correct outlook on life and world outlook. Before training or exercise, the knee joint should be well prepared, and vigorous energy should be maintained during exercise. When physical strength decreases and body fatigue occurs, great exercise should be avoided as much as possible to prevent injury. Improving the ability of knee joint becomes an indispensable part of badminton. At the same time, to master the correct technology of badminton and do a good job of special preparation is a problem worthy of attention in this mass sports activity. On the basis of not affecting the action sensitivity, properly increase the anti twist performance of the forefoot of the badminton shoes, reduce the turnover of the forefoot, so as to reduce the load moving to the inside. Before training or exercise, the knee joint should be well prepared for exercise. During exercise, keep vigorous energy. When the physical strength drops and the body is tired, try to avoid large exercise to prevent injury.

References

[1] Guo W.C. (2017). Research on the sports injuries and causes of badminton students. Sports, no. 15, pp. 60-61.

[2] Wang C, Ma S, Wang L. (2019). Research on the risk of badminton sports injury based on the strength of hip extensor and abductor muscles. Bulletin of Sports Science and Technology, no. 12, pp. 23-24.

[3] Duan Li.H., Zhang P., Wang X.W., (2015). One case of diffuse tenosynovial giant cell tumor of the knee. Journal of Hubei Medical College, no. 3, pp. 306-307.

[4] Liu S.Z., Hu Z.G., Zhang J, (2015). Inverse dynamics simulation of the athlete's lower extremity dynamic response under impact load. Medical Biomechanics, vol. 30, no. 1, pp. 30-37.

[5] Wang, M.B. (2015). The important role of core strength training in badminton training. Journal of Chifeng University: Natural Edition, no. 21, pp. 161-162.

[6] Li J.P. (2016). Footwork training in badminton training. Industry and Technology Forum, vol. 15, no. 6, pp. 160-161.

[7] Wang Y. (2015). The important role of core strength training in badminton training. Science and Technology Innovation, no. 29, pp. 161-162.

[8] Li C. (2015).Research on Badminton Multi-ball Training for Improving Physical Function. Science and Technology Innovation, no. 15, pp. 92-94.

[9] Liu P. (2015). A preliminary study on footwork training skills in college badminton teaching. Youth Sports, no. 6, pp. 107-108.

[10] Liu H. (2018). Application of multi-ball training method in amateur badminton training for young children. Chinese Teenagers, no. 29, pp. 165-165.

[11] Wu H.Y. (2016). Research on the physical characteristics and training methods of badminton. Stationery and Sport Supplies and Technology, no. 24, pp. 193-194.